INFLUENCE of CLIMATE
IN
PULMONARY CONSUMPTION

WILLIAMS

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INFLUENCE OF CLIMATE

IN THE PREVENTION AND TREATMENT OF PULMONARY CONSUMPTION

LETTSOMIAN LECTURES FOR 1876

BY

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PREFACE.

These Lectures were delivered in January 1876, and appeared at the time in the pages of the *British Medical Journal*. They have since been thoroughly revised, errors have been corrected, and large additions made, chiefly under the headings of Sea Voyages and Future Health Resorts.

The greater portion of the book is devoted to a careful analysis of the results of various climates on cases of consumption under the care of Dr. C. J. B. Williams and myself, but due reference is made to the results of other workers in the same field.

The Author is fully aware that some of his numbers are insufficient to warrant definite conclusions, especially with reference to individual health-stations, but when this is the case he has

endeavoured to exercise caution in drawing deductions; and, whatever error he may have fallen into through scanty data, a far greater one would have been committed, had he withheld from the profession facts which bear directly on the weal and woe of many invalids.

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LECTURE I.

The study of Climate has from time immemorial engaged many and skilful workers, and our knowledge of meteorology has made special strides in the last half-century. Few countries exist where observations, barometrical, thermometrical, hygrometrical, are not daily taken, either in Government observatories or by private individuals; and each morning our *Times* newspaper brings us tidings of the weather telegraphed from various parts of Europe, and anxiously looked for by farmers, by doctors, by seamen, and even by travellers waiting for a fine day to cross the Channel.

It is impossible to overrate the important services rendered by the Meteorological Office, under the able superintendence of Mr. Scott and Captain Toynbee, whose labours are, with the aid of the various

meteorological societies, building up a scientific system which bids fair to make us as weather-wise in the future as we could wish to be.

A storm appears off the West Coast of Ireland, and is instantly wired to Victoria Street, and thence intelligence is despatched to every part of the kingdom; and, when the rude South-Wester appears among us, he finds hoisted drum-signals, and our vessels—that is, those with wise skippers—snug in harbour, and fewer victims abroad for his vengeance.

Several praiseworthy attempts have been made of late to trace the effect of weather on the causation of disease, and some information on this subject has been furnished by Dr. William Farr and by Dr. Edward Ballard; but a very wide field remains open to all medical men to connect more closely the phenomena of the atmosphere with those of the human body. There is no lack of excellent works on climate, with ample meteorological data, and even long lists of the diseases prevalent on this or that soil, in order to furnish us with grounds for forming a theory as to the appropriate climate for certain diseases; but of actual results on patients we have but few tabulated records, and to these, it must be allowed, we should strive to make additions.

In contending with the great scourge of all

classes in this country—pulmonary consumption—we employ a number and variety of weapons, each, as we think, suitable to the particular case in question, and wielded with different degrees of faith and hope, according to the amount of those qualities present in the practitioners' and in the patients' minds. If any improvement be visible, we are so thankful for it, that no attempt is made to assign to each remedial agency its proper share in the work, or to separate the useful from the useless; and this is the more to be regretted, because, unless we do so, it will be impossible to lay down a practical basis for future therapeutical success, the value of each such agency remaining an unknown quantity.

It must not be supposed that I underrate for an instant the valuable works of Sir James Clark, James Johnson, Scoresby Jackson, Henry Bennet, and others; on the contrary, I admit that we owe them much; but I maintain that the great gap in our knowledge at present lies in the non-publication of results of climate on disease. Hundreds, aye, thousands of patients leave our shores yearly in the pursuit of health, and how few records of this great annual climatic experiment are communicated to the profession! Mentone and Madeira have, among others, given some results collected by local practitioners,

and the experiment of the Brompton Hospital in sending patients to Madeira, supplied some impartial information on the effects of that climate on phthisical patients of the English lower classes. For many years Dr. C. J. B. Williams and I have been noting as carefully as we can the effects of various climates on consumptive patients, and it is from these clinical stores that I propose to draw material for the present Lectures. It will be found that the statistics they furnish, though the largest yet published, are not large enough to settle all disputed points, but they will go far towards the settlement of several of importance; and it is to be hoped that other physicians with ample opportunities will be induced to come forward and give us the fruit of their long experience on these questions. Before proceeding to offer some practical results of climatic treatment it will be well to consider the exact relations which climate holds to pulmonary consumption, and these may be roughly classed as threefold :—

Firstly, as a direct cause of the disease.

Secondly, as affording immunity from the disease.

Thirdly, as ameliorating and curing it.

Now, it is an undoubted fact that, however much consumptive disease we may assign to the causation of bad food, defective ventilation, injurious occupa-

tions, heredity and the like, for a very large number of cases climate and soil are answerable; and this is the more certain, because the disease is found in various parts of the world, irrespective of habits and races. Phthisis originates in all latitudes, from the equator—where, with slight variations, the mean temperature is 80° Fahr.—to the temperate zone, where it averages about 40° Fahr., with great and sudden variations. It prevails in cold and humid climates, and also in hot ones, though a remarkable difference shows itself in the forms prevalent in temperate and in tropical countries. In the former it is extensively associated with catarrhal and inflammatory attacks, and, as a rule, runs a chronic course; in the latter it is marked by febrile symptoms and a very acute course, having much the character of rapid and general blood-poisoning, attacking other organs besides the lungs, and lasting only a few months, and sometimes only weeks. This form has been well-depicted by Guilbert and Boudin, and prevails in the littoral of Peru, in the West India Islands, and in the Society and Marquesas Islands, where it causes great ravages. According to M. Comeiras it carries off one-third of the population at Tahiti, prevailing more among the women than the men, which is exactly the reverse of what

obtains in this country. Whole families become a prey to convulsive cough. Young girls in various stages of phthisis are abandoned by their parents, and reduced to a state of emaciation dreadful to witness. In a few weeks the Tahitians pass from a most flourishing state of health into most complete wasting. This seems to be a good case of climate causing the disease, as M. Erdhel writes that some of the sailors of the French frigate 'Sirène' were attacked with this severe form of consumption while in port at Tahiti, and, in a crew of 680, twelve died, and a large number had their lungs affected.

As might be expected, different climates are the agents of causation in different races. Mr. Busk told me that, when surgeon to the Dreadnought Hospital, he made a number of *post-mortem* examinations on South Sea Islanders, who had worked their passage on board English ships to London, and, on arriving in that port, had been attacked with acute tuberculosis, which had proved fatal in a few weeks.

Another good instance is derived from those invaluable stores of climatology, the Army Medical Reports. These demonstrate the effect of the various climates on the negro troops, and show that, whereas at Sierra Leone the phthisis mortality is 6·3 per

1,000, in the Mauritius it is nearly 13 (12·9); and at Gibraltar, a station regarded as very healthy for European troops, it reaches the enormous sum of 43 per 1,000. This result is the more striking, because the phthisis mortality for white soldiers at Gibraltar is only 5·3 per 1,000, and establishes, says M. Boudin, the incompatibility of the negro race with the climate even of the South of Europe.

We may fairly conclude, therefore, that certain forms of climate are direct causes of consumption to certain races; and next let us consider how far climate affords exemption from the disease. We will carefully study the theories of immunity from phthisis mentioned by authors, which may be described as follows:—

1. The high altitude theory.
2. The theory of great cold causing immunity.
3. The theory of the immunity from phthisis through the prevalence of ague.

The first or high altitude theory is at present the one most discussed, and has been strongly advocated by Archibald Smith, Fuchs, Lombard, Brehmer, Küchenmeister, Mühry, and Hermann Weber, among others. Fuchs, in 1853, noticed that the phthisis mortality in towns on the sea-level, instancing Hamburg and Marseilles, was far larger than that of

other towns situated at various elevations above it. He found that the phthisis mortality at Hamburg compared with the total mortality was 25 per cent.; whereas at Eschwege, 496 feet high, it was only 12 per cent.; and at Botterode, in Thuringia, 1,840 feet above the sea-level, the percentage was only 0·9.

Brehmer denies the existence of phthisis in Görbersdorf, in Silesia, which is 1,700 feet above the sea-level; and Virchow states that the disease is rarely seen in the Spessart, which lies about 1,400 feet high. Dr. Lombard of Geneva was one of the first to draw attention to the comparative rarity of phthisis in the high-lying habitable districts of Switzerland; and he remarks that he had never known an instance of phthisical disease among the monks of St. Bernard. The latest edition of his work, 'Les Climats de Montagnes,' contains a mass of information, with his latest opinions on the subject. His original facts have been supplemented lately by the results of the Helvetic Society of Natural Sciences, which took up the subject, and sent out circulars to the Swiss medical men living at various altitudes, to request them to furnish information as to the relative phthisis mortality in their districts for a period of five years, viz., 1865–1869 (inclusive). Four cantons—Valais, Neuchâtel, Vaud, and Geneva—

were assigned to Dr. Lombard, and he has arranged their statistics in three classes, according to the altitude of the locality :—

1. Statistics of localities of low altitude (*basses régions*), situated between 1,250 and 1,650 feet above the sea-level.

2. Statistics of localities of moderate altitude (*régions moyennes*), at an elevation of between 1,725 and 2,700 feet.

3. Those of high-level localities (*hautes régions*), situated from 2,700 to 4,000 feet above the sea-level.

The 'low altitude' class gave a phthisis mortality of 10·2 per cent.; the moderate altitudes, one of 9·4 per cent.; and the high level, one of only 5·1 per cent.; and certainly these bear out Dr. Lombard's conclusion that, while localities of low and moderate altitudes—that is, between 1,250 and 3,000 feet—present a large phthisis mortality, above this 'phthisis zone,' as he terms it, the disease diminishes, becoming extremely rare; and above 5,000 feet it disappears altogether.

Similar evidence is given by Drs. Berry and Brügger, from the Upper Engadin, lying 5,000 and 6,000 feet above the sea; and by Dr. Spengler at Davos-Platz, situated at a slightly lower elevation.

These authorities state that phthisis is unknown in these tracts, except in persons who have contracted it at a lower level; but that the migratory and enterprising habits of these mountaineers lead them to quit their untainted fastnesses, and to wander over Europe in search of gain, and residing in towns they contract phthisis.

By far the most valuable testimony, however, was afforded by the originator of the theory, Dr. Archibald Smith, in reference to the Peruvian Andes, where he practised for twenty-five years, residing at various levels above the sea, at Lima, at Cerropasco, and at Huanuco, and made good use of his opportunities in studying the climate. He noticed that, while phthisis was not uncommon, and, moreover, assumed a very acute form, near the sea, it was unknown[1] in the regions above 8,000 feet, except, to use his own expression, 'as an exotic.' This evidence is important, because we know that, even up to 13,500 feet, large towns are found in that part of South America, such as La Paz, the capital of Bolivia; and therefore there probably exist some of the causes specially favourable to the development of phthisis, inseparable from town-life, such as overcrowding and

[1] The observations of M. Zapater, cited further on, show this to be not quite correct.

indoor pursuits, and other unsanitary conditions, from which the scattered hamlets and chalets of the high regions in Switzerland are for the most part free.

In confirmation of Archibald Smith, Dr. Tschudi stated that he had never seen a case of phthisis among the Indians of Peru who live in these elevated regions. Jourdanet fixed the immunity line in Mexico—that is, between 20 and 30 degrees north latitude—at about 7,000 feet; and he drew attention to certain peculiarities in the conformation of the Mexican Indians, who, though of middle height, have unusually large and wide chests, quite out of proportion to their size. He considered that it is their enlarged chests which enable them to undergo such great exertions in walking and climbing. It is not impossible that this change in their development is due to the effect of low barometric pressure.

Küchenmeister, then, with true German ideas of generalisation, constructs a system, fixing the elevation of immunity from phthisis for every degree of north and south latitude: and states that, for Germany and Switzerland, the removal of one degree from north to south would render an extra elevation of 375 feet necessary; and inversely, from south to north, this immunity level would fall 375 feet. This necessitates an elevation of 3,000 feet for Switzerland,

and about 9,000 feet at the equator. The causes of this alleged immunity are variously given. Some state that the constitution is improved by increase of appetite and of the powers of digestion; others, like Dr. Walshe, hold that the continued inhalation of rarefied air causes increased capacity of the lungs and chest; and it must be admitted that Jourdanet's observations, mentioned above, confirm the last opinion. Ornellas states that under the Andine influence the circulation becomes more active and the respirations are more deeply drawn, and that emphysema often results.

Such is the mountain theory; and we will proceed to examine it.

The first great objection appears to be that it entirely ignores all factors which constitute a climate *other* than altitude, such as soil, site, prevalent winds, rainfall, moisture, and temperature. It might be argued, as regards Switzerland, that the diminution of phthisis in the higher districts was due to the fact of the population being more scattered, or, as Dr. Lombard very properly suggests, to the substitution of agricultural open air habits for more or less indoor pursuits, and to the greater dryness of the soil and air. Furthermore, as Dr. Symes Thompson has pointed out, it might be better to take as a basis

isothermal lines rather than those of latitude; it being ascertained that various places within the same degree of latitude often differ entirely in climatic conditions.

The second objection applies specially to Küchenmeister's attempted classification; for while he fixes the immunity line for phthisis at about 3,000 feet for Switzerland, Lombard's statistics give us a phthisis mortality of five per cent. up to nearly 4,000 feet, which, as far as Switzerland is concerned, demolishes this neat generalisation; and Lombard himself is of opinion that no exact line of immunity can be drawn.

Dr. Hermann Weber, in his valuable contribution to the 'Medico-Chirurgical Transactions,' on 'Treatment of Phthisis by Prolonged Residence in Elevated Regions,' also considers that it is scarcely probable that a fixed elevation for immunity will be found for every degree of latitude, as even in the same mountain-range he detects difference in this respect; thus, he ascertained the existence of phthisis at Splügen (4,700 feet) and at Andermatt (same level), while it was absent at Klosters, a few hundred feet lower; and even in the Engadin, which boasts of entire immunity from the disease, Dr. Ludwig, of Pontresina, found a case of consumption in a man

who had never lived at a lower level than 4,000 feet.

But the crowning objection appears to come from Asia, from the Kirghis land. According to M. Maydell this vagrant population of upwards of a million in number are quite exempt from phthisis, although they live, not on Himalayas or Andes, or on Alps, but on a steppe 100 feet below the sea-level. The fact of their feeding on koumiss has, it should be mentioned, been urged as a reason for their immunity.

And to sum up: though it is evident from the experience of the high climates of the Andes that great elevation when combined with warmth and dryness may bring about immunity from the disease, this is not invariably the case in mountain regions, and a like immunity may exist under the very opposite circumstances, viz., at low levels.

The chief features which appear to be common to all mountain climates, compared with low-lying districts, are the lower barometrical pressure; and, in winter, the greater dryness from the comparative absence of vegetation, as well as the increased power of the sun's rays from the greater clearness of the atmosphere. This phenomenon has been well established by the observations at Davos, in Grisons, of

Dr. Frankland and of Mr. Waters; and is proved, also, by the tanning of the skin in patients who have wintered there. This greater warmth from the sun explains, also, the accounts of mid-winter picnics, at which we, even in this mild insular climate, shudder, and hardly realise. We must not, however, lose sight of the very various conditions attached to mountain climates; for how can we reconcile that of Santa-Fé de Bogota, in the Andes, having a mean temperature similar to that of Malaga, with the snows and frost of the Grisons?

A second theory is, that great cold causes immunity; and that, as you advance further north, the phthisis mortality decreases. A strong argument in favour of this is the rarity of the disease in Finmark, in the northern portions of Scandinavia, in the Faroe Islands, and in Iceland. Shetland was formerly considered free from the scourge; but the careful report of the late Dr. Saxby of Unst shows it to be as prevalent there as in the north of Scotland. As regards Iceland, Dr. Leared and Dr. Hjaltelin maintain, from a very large experience, that phthisis does not exist there; on the other hand, Dr. MacCormac quotes from Dr. Schleisner, who was sent by the Danish Government to report on the sanitary condition of Iceland, to the effect that twenty-two cases of phthisis

came under his notice in the island, of which five had vomicæ of the lungs, besides his meeting with several scrofulous families. Dr. MacCormac also tells us that the late Sir Henry Holland, during his last visit to Iceland, in 1871, was called to see two patients with Dr. Hjaltelin, and both of them proved to be cases of pulmonary consumption.

Greenland and its Esquimaux have often been cited as an instance of immunity from phthisis; and several visitors have stated that, while influenza prevails extensively, consumption is practically unknown. Now, I have in my possession an interesting document which throws considerable light on this subject; it is the Government list of mortality in Greenland from 1870 to 1874 inclusive, furnished by the Governor to Mr. Gwyn Jeffreys, on his return from the Arctic regions in H.M.S. 'Valorous.' It has been translated from the Danish by the naval surgeon. According to this the population consisted, in 1874, of 4,115 Esquimaux and mixed breeds. In 1871, 46 persons died of diseases of the chest, under which heading are classed phthisis, pneumonia, bronchitis, and pleuritis. In 1872 the deaths under this heading were 63; in 1873, 19; in 1874, 35. With the exception of epidemics, diseases of the chest furnished the largest quota of the mortality. The

report states that measles was prevalent in 1872; that typhoid fever killed many in 1871; and that ophthalmia is very frequent. Venereal diseases are unknown, and *consumption is common*. Competent medical men are said to be scarce in Greenland; and perhaps this accounts for the number of deaths from each form of chest-disease not being distinctly specified; but it must be admitted that the report, as far as it goes, leaves little doubt as to the existence of pulmonary consumption in that country; and it is possible that further investigations may give similar results as to the mortality of other cold countries.

A negative argument in favour of this theory is the virulent form of the disease when it prevails in hot climates, such as Tahiti, the Marquesas, and Bourbon; but here,[1] again, our valuable Army Reports assign to the Presidency of Madras, which is an exceedingly hot region, one of the lowest phthisis mortalities of all the countries where the British army is stationed; while among the Sepoys the mortality from this cause is even less. Thus, I

[1] The Army Medical Reports show how little reliance can be placed on the cold immunity theory, for it appears that the mortality in Bengal from phthisis is almost precisely the same as in Canada (1·707 and 1·71 per 1,000 respectively).—Parkes' *Practical Hygiene*, p. 643.

fear, we must conclude that cold alone will not give immunity.

The third theory of immunity, viz., that from the prevalence of ague, is supported by some striking evidence. Dr. Green reported of Whitehale, in the United States, that, where marsh-fevers prevailed, no instance of phthisis was developed; and he also states that, on a marsh near Rutland being drained, the endemic intermittent fever disappeared, and phthisis, hitherto unknown, then became common. At the request of the inhabitants the old order of things was reverted to, and the marsh re-established, when fever reasserted her sway to the banishment of consumption. Dr. Drake of the United States also gives evidence to the same effect; and Professor Schönlein recounts an interesting example occurring in Switzerland, in the boggy tracts which separate the lakes of Zurich and Wallenstadt; for when this country was drained malarial fevers ceased, and a new enemy, phthisis, took their place.

Many other physicians give testimony to the same effect, and show that the antagonism of ague to phthisis is stronger in the centre of a marshy district than on its confines, though even here cases of phthisis are comparatively rare. Children born in malarious countries seem to lose this strange im-

munity when sent away, as is often the case, for educational purposes; but it is alleged that the course of phthisis when once established is considerably retarded by removal to a marshy district. My own observations, however, run somewhat counter to this last statement; for in several hopeful cases of arrested phthisis under my care, attacks of intermittent fever have rekindled the disease, possibly by inducing pulmonary congestion, and hastened on the process of lung-disorganisation to a fatal issue. Mr. Gulliver tells me that in the Fen district of Lincolnshire consumption was once a sort of myth among the medical men; and in Mr. Haviland's splendid map of the distribution of phthisis in England among females Lincolnshire still shows a very low mortality from phthisis, which, according to the author, can only be explained by the fact of malarious districts still existing. That a certain amount of consumption prevails in Lincolnshire I can testify; for instance, in the neighbourhood of Navenby, bordering on the Fens, I saw a case of clearly endemic phthisis, in consultation with Dr. Andrew Campbell, who informed me that the disease was common in that district.

The theory of certain kinds of food causing immunity from consumption seems to rest on some foundation, though the facts accumulated are too few

to substantiate it thoroughly. The great instance, already alluded to, is that of the Kirghis and their mare-koumiss; but this diet has been tried in other parts of Russia without the nomad life, and has failed, and it remains to be seen what results the Koumiss Cure Establishment, lately set up at Wiesbaden, may give. There is no doubt that many predisposed to phthisis are yearly saved by the adoption of a highly oleaginous and nutritive dietary.

Let us approach our third topic, namely, climate as a curative agent in consumption. Now, I touch on this part of my subject with some timidity, because I know that great scepticism has often been expressed as to whether climate ever does much good in consumption, and whether we are at all justified in recommending change of climate to a patient in whom the signs of consumption have been detected; but this is one of my chief reasons for making this the subject of my Lectures, in order to offer to the profession some fair data to go upon in the matter. There is no doubt that in all climates and in all countries there have been recoveries from phthisis; and, moreover, many instances of phthisis arising in one country have recovered in another; or, again, they may have recovered in the same country; but the question really is, whether certain countries have afforded

better results in the treatment of phthisis than certain other countries. The reports from Dr. Archibald Smith, Dr. Guilbert, Dr. Walshe, and Dr. Hermann Weber, about the results of the treatment of phthisis in the Andes, are certainly most striking, and would make us incline to advise all consumptives, who could manage it, to repair to that very elevated region. Dr. Guilbert carefully narrates six instances of the arrest of the disease from prolonged residence in these mountains, two of the patients being Frenchmen, one Swiss, and three South Americans. Of these, one so remarkably displayed the influence of climate, that I cannot forbear from giving an abstract of the case.

A Swiss clockmaker, aged 27, who had lost both parents from consumption, was attacked with cough and large hæmoptysis, followed by loss of flesh and night-sweats. He was recommended a change of climate, and accordingly repaired to America, and set up a watchmaker's shop at Panama, a low-lying town situated on the isthmus of that name. Here the disease progressed; and, following advice, he travelled to Quito, in the Andes, 9,500 feet above the sea-level, where he remained six months, at the end of which period he had regained his original weight, lost the fever and night-sweats, and had an excellent appetite

and scarcely any cough. He returned to Panama, and led a temperate and moderate life; but after some months the cough, night-sweats, and fever all returned, accompanied by diarrhœa and wasting. A second visit to Quito was recommended, and carried out with the same favourable results, and a return to Panama with the same unfavourable ones. A third journey was then made to Quito, where he remained nine months, and was strong enough to visit some of the higher mountains of the range, though it is not recorded that he performed any mountaineering feats. He returned to Panama so well that he had a firm conviction that he was cured; but he never lost his cough, and a recurrence of his symptoms soon drove him to the heights. This time he chose Arequipa, a town lying between 8,000 and 9,000 feet above the sea, and here for the fifth time he regained his health; but, with a strange fatality, he quitted the mountains and retired to Tacna, a place at a considerably lower level. Some time afterwards Dr. Guilbert examined him, and described him as in a state of terrible emaciation, looking more like a corpse than a living being, suffering from fever and night-sweats, with entire loss of appetite, diarrhœa, and a troublesome fistula, and having severe cough and large expectoration. He also detected the exist-

ence of cavities in both lungs, and scattered crepitation at the bases, and, having prescribed palliatives, he quitted the patient, under the impression that he should see his face no more. But he was mistaken. Dr. Guilbert ascended to La Paz, the capital of Bolivia, at an altitude of 13,500 feet, and here shortly afterwards the patient turned up, having followed his doctor more slowly, and now astonishing him by his rapid improvement. The fever, sweats, diarrhœa, had all disappeared; the expectoration had diminished; the appetite returned; and during some excursions they made together the patient is reported to have walked as well as the doctor, and to have been free from the 'soroche,' or mountain-sickness, which is troublesome to new comers in these parts. The cavities remained unchanged. Thus for the seventh time the Andes rescued him from the jaws of death; and it had been well if he had clung to them. Unfortunately, he returned to Europe and Neuchâtel on private business; the disease made fresh progress; he was ordered to Eaux Bonnes, and died there a few days after his arrival. I suppose few more powerful instances of the arresting power of mountain climate could be adduced than this one.

Dr. Hermann Weber, in the fifty-second volume of the *Medico-Chirurgical Transactions*, gives an

account of seventeen cases of phthisis, all more or less exhibiting the curative influence of high mountain climates, among which by far the most successful are the eight instances of patients sent by his own or by Dr. Archibald's Smith's advice to various towns in the Andes or in Mexico, where they passed long periods, often years.

The evidence of the Peruvians themselves is exceedingly strong in favour of this mountain-cure, for it has long been the custom at Lima and Tacna, where phthisis is prevalent, and has naturally only a duration of from three to six months, to send the consumptives to the valley of Jauja, 10,000 feet above the sea-level, where the Government has established a hospital for them, in which 79 per cent. are reported by Dr. Fuentes to recover.

Dr. C. J. B. Williams and Dr. Walshe have both published interesting cases of arrest in these regions; and the latter has noted that in one of his cases, where excavations had been detected in one lung and softening in the other, after the residence at Santa Fè de Bogota, in the Andes of Granada, complete arrest took place; and Dr. Walshe could only detect weak breathing and slight want of tone under one clavicle; he also found the chest distinctly widened by the influence of the mountain air.

It is not necessary to add more to the testimony already adduced in favour of the curative influence of these mountain climates; but it will not be difficult to show, from my statistics, that the results of other climates are likewise very successful. Take, for instance, Egypt, a remarkably dry warm climate, but not marked by high altitudes. According to my statistics, published in the *Medico-Chirurgical Transactions*, vol. 55, of twenty phthisical patients sent by Dr. C. J. B. Williams and myself, 65 per cent. improved, 25 per cent. remained stationary, and only 10 per cent. became worse, each of the patients having passed at least one winter in the land of the Pharaohs.

Again, of 152 patients who wintered at various places situated on the shores of the Mediterranean, 62½ per cent. showed marked signs of improvement, 20 per cent. remained stationary, and only 17 per cent. deteriorated.

I will not dwell more on these statistics, as they will be referred to again in the last Lecture; but I merely cite them now to show that we may fairly conclude that climate does exercise healing influence in phthisis, and that that influence is not confined to mountain districts, but is shared by climates of

various regions, differing greatly in latitude, altitude, and meteorology.

Now, to deal with one of the principal subjects of these Lectures—the results of the climate of the British health-resorts on consumptive patients; and, before entering on the statistics of the cases, let us take a glance at the climate of the British isles, and the chief sources of its warmth. This topic has been selected on account of its general interest, for we most of us know something of these places, having sent our patients and friends thither, and having visited them ourselves. Therefore I shall not trouble you with long descriptions either of the localities or of the climates, but, taking a general survey of their meteorological features, draw attention to such points of difference between them as appear to me to be of value. We have mostly to deal with the English south coast, from Cornwall to Sussex; and, on the whole, this is renowned for its mild winter temperature, which surpasses in warmth and equability not only most inland places of Great Britain, but many spots lying in latitudes considerably further south.

We know that our climate is eminently insular, not being subject to great extremes of heat and cold, but being remarkably equable throughout the year

— mild in winter, cool in summer. The influence of the sea is everywhere felt, though more so at places in its immediate vicinity; and this conserving influence on the temperature is also seen decidedly, though in a less degree than on the ocean coast, in the openings of the Irish Sea and the English Channel. The coasts of Ireland and of the west and north of Wales participate in this genial influence, so that the mean temperature of Llandudno in January is about equal to that of Ventnor in the same month.

To what can we attribute this warming effect of our encircling waters? Formerly it was entirely set down to the account of the Gulf Stream; but Dr. Carpenter and other eminent physicists have thrown some doubt on this theory; and it has been objected, that the Gulf Stream, after leaving the American coast, spreads over so wide an area that, before reaching the thirtieth meridian, it is practically dispersed by the process of thinning off and superficial extension. Dr. Carpenter attributed the warmth of our shores to the great general movement of warm equatorial water towards the polar area, the result of a general interchange of polar and equatorial waters, quite independent of such local accidents as those which produce the Gulf Stream proper, and giving movement to a much larger and deeper body of water

than the latter can effect. Sir Wyville Thomson, on the other hand, is inclined to regard the Gulf Stream[1] as simply the reflex of the equatorial current,

[1] Similar phenomena to those of the Atlantic Gulf Stream are to be found in the Pacific. The North Pacific equatorial current passing westwards as the 'Kuro Siwo' current meets the Fiji Islands, the New Hebrides, and the island of Papua, and gains a northerly direction; but falling into the region of the monsoons, is thwarted for half the year. It, however, reaches the south coast of Papua as a very palpable and apparently permanent current, exercising a perceptible thermic influence to a depth of at least 300 fathoms, and according to the 'Challenger' expedition observations it may be traced across the Pacific to 175° West longitude. This Pacific current exercises less influence than the Atlantic Gulf Stream, partly because it is weakened by the monsoons, and partly because its force is diminished in the channels of the Malay archipelago, there being no unbroken barrier like the American coast-line to give it a definite bent. The recent interesting results of the 'Challenger' soundings in the Atlantic and Pacific throw considerable light on the distribution of ocean temperature, a subject that no climatologist can afford to overlook, and one that may one day be found to influence largely the temperature of continents.

The conclusions Sir Wyville Thomson appears to have arrived at from the 'Challenger' observations are that in both Atlantic and Pacific there exists (1) a superficial layer of water extending to a depth of 500 or 600 fathoms, and the temperature of which is regulated by surface curents, arising from permanent, periodic, and variable winds; (2) a deep layer of far greater extent which fills up the trough of both oceans, does not vary greatly in temperature at different seasons, and is always below 4° C. (39° Fahr.) This is a mass of cold water constantly moving northwards, from the Antarctic towards the Arctic pole, and is evidently an indraught from the Southern Ocean, of which both Atlantic and Pacific Oceans may be regarded as inlets or gulfs.

added to, during its north-easterly course, by the surface-drift of the anti-trade winds, which follow,

The influx of old water from the northward is explained by the excess of evaporation over precipitation in the northern part of the land hemisphere, and the excess of precipitation over evaporation in the middle and southern part of the water hemisphere. In the Pacific the line of division between the superficial and deep layers is the isotherm, or rather, as Sir W. Thomson terms it, the isothermobath of 5° C. (41° Fahr.), which maintains a tolerably even course between 400 and 500 fathoms, sinking slightly at the equator from some mingling of the equatorial current, and rising in latitude 40° N. from the accumulation of cold water against the Arctic barrier. The currents from the north, viz. from the sea of Okotsk and Behring's Straits, are too trifling to affect the mass of the Pacific, especially as the greater part of the latter Strait is occupied by a warm out-current from the Pacific.

The temperature of the water of the Pacific in latitude 35° N. is lower for the first 1,000 fathoms than in the Atlantic in the corresponding latitude; and whilst in the last 1,000 fathoms the Atlantic temperature sinks gradually though slightly, in the Pacific the minimum temperature of 1·7° C. (35° Fahr.) is reached at a depth of 1,400 fathoms, and from that depth to the bottom the temperature is the same.

Sir Wyville Thomson's special conclusions about the Atlantic appear to be: (1) that the water of the Southern Sea simply wells up into the Atlantic, and that all the temperature bands of the Western Atlantic are essentially continuous with like temperature bands in the Southern Sea with these modifications; that above a certain line, roughly represented by the isothermobaths of 4° C. to 5° C. the temperature of the water is manifestly affected by direct radiation and by the very complicated effects, direct or indirect, of wind-currents, and (2) that the whole mass of under-water gradually and uniformly rises in temperature towards the head of the Gulf.

(3) That water at any given temperature below 4° C. can only occur in the Atlantic where there is a direct communication with

in the main, the same direction. He thus graphically describes its course: 'The scope and limit of the Gulf Stream will be better understood if we enquire, in the first place, into its origin and cause. As is

the zone of water at the same temperature in the Northern Sea, without any continuous barrier. The actual result of the present barriers is that, however great the depth may be, no water at a temperature lower than 1·3° C. is found to the north of the equator, and no water below the freezing-point in any part of the trough, except in the depression between the mouth of the River Plate and Tristan d'Acunha.

(4) That the water of the Atlantic is not sensibly affected by any cold indraught from the Arctic Sea, *i.e.* either by the Labrador or the Spitzbergen currents, which do not sensibly lower the general temperatures of the North Atlantic.

(5) That although there is a considerable flow of surface-water through the influence of wind-currents from the Atlantic into the Southern Sea, that flow does not seem to balance the influx into the basin of the Atlantic. It is probable that the general circulation is kept up chiefly by an excess of evaporation in the region of the North Atlantic balancing a corresponding excess of precipitation over evaporation in the water hemisphere. This conclusion has been recently confirmed by Sir George Nares. The principal reasons for this excess are, the lower barometric pressure and the supposed greater amount of rainfall in the Southern Sea, the higher specific gravity at the surface than at greater depths in the Atlantic, and the higher specific gravity of the surface-water in the Atlantic to the north than to the south of the equator.

Sir George Nares in his recent paper on the 'North Circumpolar Sea' proves the existence of two currents flowing southwards from that sea, one along the west coast of Baffin's Bay, and the other along the east coast of Greenland at the rate of four miles a day, and these probably affect the temperature of the Atlantic to a considerable extent.

well known—in two bands, one to the north and the other to the south of the equator—the north-east and south-east trade-winds, reduced to meridional directions by the eastward frictional impulse of the earth's rotation, drive before them a magnificent surface-current of hot water 4,000 miles long by 450 miles broad, at an average rate of 30 miles a day. Off the coast of Africa, near its starting-point, to the south of the islands of St. Thomas and Anna Bon, this equatorial current has a speed of 40 miles in the twenty-four hours, and a temperature of 23° C. (73° Fahr.)

'Increasing quickly in bulk, and spreading out more and more on both sides of the equator, it flows rapidly due west towards the coast of America. Towards the eastern point of South America, Cape St. Roque, the equatorial current splits into two, and one portion trends southwards to deflect the isotherms of 21° C. (70° Fahr.), 15·5° C. (60° Fahr.), 10° and 4·5° C. (50° and 40° Fahr.), into loops upon our maps, thus carrying a scrap of comfort to the Falkland Islands and Cape Horn, while the northern portion follows the north-east coast of South America, gaining continually in temperature under the influence of the tropical sun. Its speed has now increased to 68 miles in twenty-four hours, and, by

the union with it of the waters of the River Amazon, it rises to 100 miles (6·5 feet in a second); but it soon falls off again when it gets into the Carribean Sea. Flowing slowly through the whole length of this sea, it reaches the Gulf of Mexico through the Straits of Yucatan, when a part of it sweeps immediately round Cuba; but the main stream, having made the circuit of the Gulf of Mexico, passes through the Strait of Florida; thence it issues as the Gulf Stream in a majestic current upwards of 30 miles broad, 2,200 feet deep, with an average velocity of 4 miles an hour, and a temperature of 86° F. (30° C.) The hot water pours from the strait with a decided though slight north-easterly impulse, on account of its great initial velocity.'

It follows the line of the American coast, and abuts on the cold Labrador current, the two streams being so distinct that a vessel may have her bows in one and her stern in the other, the thermometer registering a difference between them of 30° Fahr. Continuing to ascend, the current passes Sandy Hook, near New York, and reaches Cape Cod, latitude 41°, and thence spreads chiefly eastward, the velocity having greatly diminished.

According to Professor Buff a great part of the warm water is carried, partly by its own motion, but

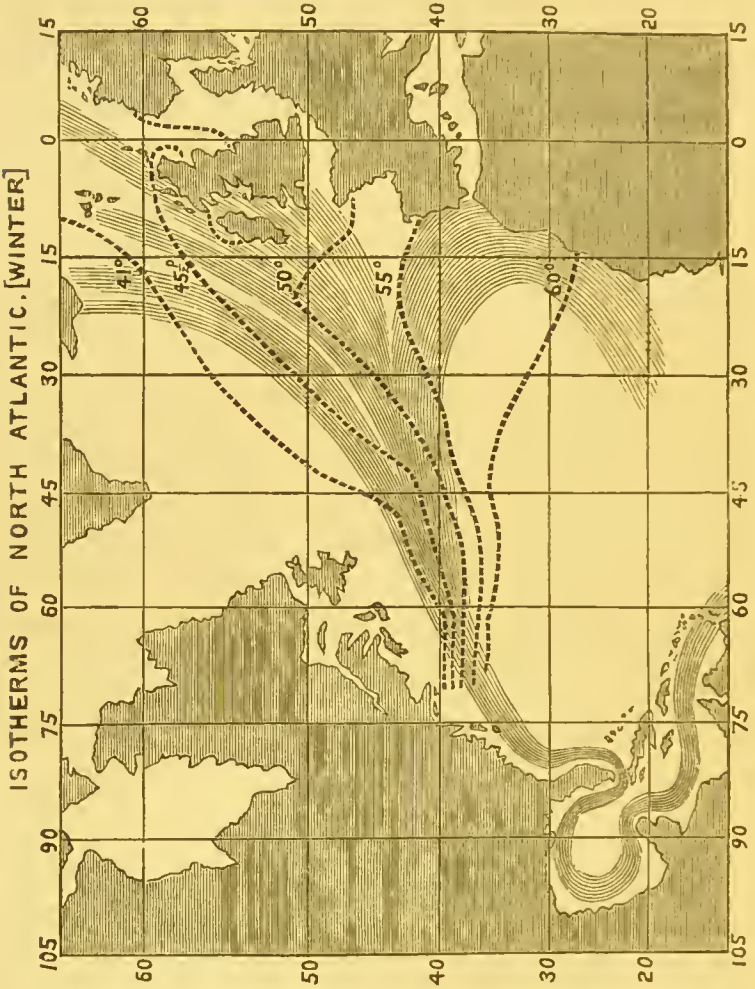
chiefly by the prevailing west and north-west winds, towards our own coasts and those of Norway and Spitzbergen. This water can be traced across the Atlantic, skirting the coasts of France, Great Britain, Scandinavia, rounding the North Cape, and passing the White Sea and the Sea of Kara, along the western shores of Nova Zembla and Spitzbergen; and, after coursing round the coast of Siberia, a trace of it may be found in Behring's Straits entering the North Pacific.

One proof that a current takes this direction is the fact that drift-wood and tropical products from the Gulf of Florida have been washed on the western shores of Ireland, Great Britain, the Hebrides, Orkney, Shetland, and the Faroe Isles, Norway, and even Spitzbergen; but a stronger proof still lies in the direction of the isothermal lines of the North Atlantic, for these attribute a far higher degree of warmth to the European shores than to those in the same latitude on the American continent.

The annexed woodcut,[1] adapted from Dr. Carpenter's paper ('Good Words,' 1873), shows that the isotherm of 41° Fahr. runs through the American coast near Philadelphia, and slants in a north-easterly direction between Iceland and the Faroe Islands. The isotherm of 45½° Fahr. starts from the American coast

[1] See p. 34.

at about latitude 38°, and runs to the north of Scotland and Ireland, and far up in Norway to latitude 60°.



Thus the warm current causes a diversion of the temperature lines to the extent of upwards of 20° of latitude.

It is thus seen that those physicists who do not accept the theory of the Gulf Stream reaching our

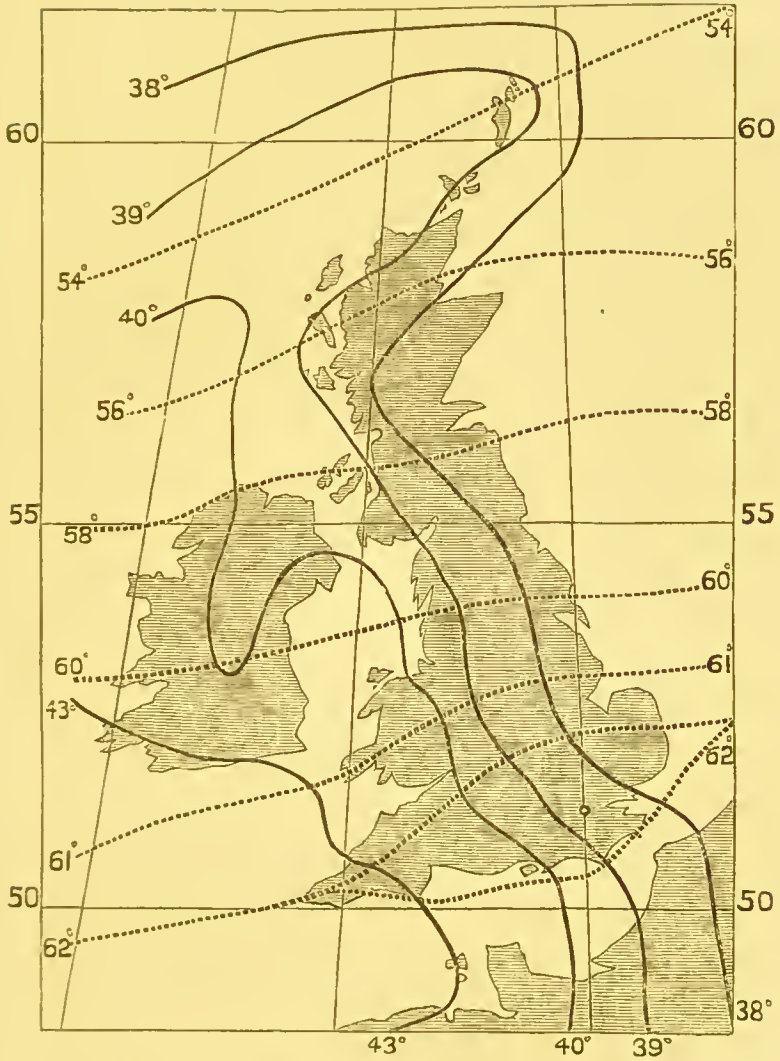
coasts hold that a considerable portion of this warmth may be assigned to the westerly winds which follow its course, and, deriving heat from it, carry this onwards to us.

The broad fact with which we have to deal, as medical men, in considering our climate is, that a warming influence reaches its shores from the Atlantic, traceable somehow to a reversed equatorial current—a current most apparent in the Straits of Florida and off the American coast; but whether this warming influence be conveyed by the Gulf Stream itself or by a drift current, as the cautious Admiralty chart indicates, is immaterial. We know that, though the waters of the Gulf Stream may lose their heat after the thirtieth meridian is passed, the said heat has been absorbed by the air, and is brought to us as warm south-west winds; and not only this, but all the heat received by the current in the tropics above 86° Fahr. becomes latent, and is given back in temperate latitudes as free atmospheric heat. It is sufficient to recognise the original source of all this warmth; and to acknowledge that full exposure to it, as is seen on the west coast of Ireland, in Devonshire, and Cornwall, implies considerable advantages in mean and winter temperatures, as well as a larger rainfall and greater equability of climate.

LECTURE II.

HOME CLIMATES AND THEIR RESULTS ON CONSUMPTION.

I WOULD now draw your attention to the isothermal lines of Great Britain and Ireland, not only as regards the climates of the whole, but as affecting particular portions of these islands in different months; for the monthly isothermal lines drawn by Mr. Alexander Buchan show very important facts, and I have attempted in the subjoined map to give some of their results. The continuous black lines indicate the isothermals of January; the dotted lines those of August. It appears that, in winter, the isotherms, instead of following the lines of latitude, pursue an exactly opposite course, and during the months of December and January are almost vertical; thus the warm places are on the west and south coast in winter, and the cold ones on the east coast. The isotherm of 43° Fahr. runs through the extreme south-west of Ireland, through Devonshire and the Channel Islands;



ISOTHERMS OF BRITISH ISLES (JANUARY AND AUGUST).

the line of 39° Fahr. passes through the Shetlands, along the islands off the west coast of Scotland to Hastings; and that of 40° Fahr. through the Isle of Man, Llandudno, and Portsmouth.

We see, too, that the British Channel varies greatly in its winter climates, and, as we advance from the Land's End and approach the Straits of Dover, the winter temperature gradually falls.

In the month of January, in the Scilly Islands, it is 46° Fahr.; at Helston, in Cornwall, it is 45° Fahr.; at Torquay it is 42°·4 Fahr.; at Ventnor it is 41°·6 Fahr.; at Worthing, 39°·6 Fahr.; at Eastbourne, 39°·3 Fahr.

We may thus conclude that, in the winter, the western portion of the British Channel is far warmer than the eastern.

Thermometrical observations have proved that the water of the sea off the coasts of Devonshire and Cornwall is seldom lower than 45° Fahr. in mid-winter; and Mr. Whitley once found it as high as 50° Fahr. off the Cornish coast in December, when the westerly winds had been blowing for some days; and in the Scilly Isles the temperature records tell us that, in twelve years, frost only appeared during four winters, while the mean temperature in December is sometimes as high as 51° Fahr. This is after westerly winds.

As the sun gains power the isothermal lines tend more and more to follow the direction of the latitude; so that in April they have quite changed their course; and in August, as is seen in our map, they become nearly horizontal, showing, if anything, a tendency towards greater heat on the eastern than on the western shores. This greater heat of the eastern coast in summer is due, as Captain Toynbee pointed out to me, to two reasons: partly to the equalising influence of the Gulf Stream being less felt than on the western coasts, and partly to the effect of the adjacent continent, which extends in an unbroken line to the shores of China.

We thus see the extraordinary influence exercised by the Atlantic and its currents over our climate It raises the winter temperature of the whole of our west coasts, and at the same time moderates their summer heat; this double influence waning as we approach the eastern shores, where the extremes become more prominent, the winters being colder and the summers hotter. In the British Channel, Devonshire and Cornwall are most affected by it, and Sussex least so; and this is the reason of the difference in mean winter temperature between Torquay and Hastings—a difference of 5° Fahr. All these places are contained between latitudes 50 and

51, and are situated on a coast-line varying greatly in outline, deeply indented in Cornwall, Devonshire, and Dorsetshire, and tolerably uniform in Sussex. Most of the health-stations have a sheltering background of hills or cliffs to screen them from northerly winds.

The rainfall varies from 23 to 44 inches, according to the proximity to mountains; and the number of rainy days from 132 to 178. The range of temperature varies from 27 to 33. The prevailing winds are westerly.

Having sketched the leading meteorological features of the climate of our British Channel, and noticed the peculiarities distinguishing particular regions, we will give a concise account of 243 consumptive patients who passed one or more winters unders its influence with the object of benefiting their health. These, with few exceptions, were not inhabitants of these places, but hailed from other localities.

As regards sex, 135 were males, and 108 females. In most statistics of phthisis the males are found to be more numerous than the females, the proportion generally being three males to two females; but, among these, the females are more than ordinarily numerous, showing a ratio of four females to every

five males; and it will be well to bear this in mind when we examine their after-career.

TABLE I.

	MALES		FEMALES		TOTAL	
	No.	Percentage	No.	Percentage	No.	Percentage
Under 20 years .	21	15·56	31	28·70	52	21·40
20 to 30 „ .	49	36·30	50	46·30	99	40·07
30 to 40 „ .	43	31·85	21	19·45	64	22·23
40 to 50 „ .	17	12·59	2	1·87	19	7·81
50 to 60 „ .	4	2·96	3	2·78	7	2·88
60 and upwards .	1		1		2	
Total . .	135		108		243	

As to ages, these have been arranged in Table I. In this, as in all my statistics, I have taken the age, as far as it can be ascertained, at which the patient was attacked with consumption, and not that at the time when the physician was consulted, which is an uncertain and often fortuitous circumstance, and, in chronic cases, would afford no data whatever for calculation. The patients were attacked at ages varying from 7 to 80; in the greater number, between 10 and 40; the larger number of females being attacked between 10 and 30; the larger number of males, on the other hand, between 20 and 40; the average age of attack among the males being 29½ and among the females 25·39. This, again, is ac-

cording to the law which I have deduced elsewhere,[1] that females are attacked earlier than males.

Family predisposition was present in 118, *i.e.*, in about half of the cases; and hereditary predisposition—*i.e.*, distinctly traced disease—in one or both parents or grandparents—was present in 29, or about 12 (11·93) per cent. This corresponds again with the average in cases of phthisis in the upper classes.

Origin and Nature of Disease.—It would take up far too much of the Society's time to give a detailed account of the pathological condition of these patients, or of the causes and modes of origin in each case; but it will be sufficient to sketch, in a few bold outlines, the forms of consumptive disease with which we have to deal.

Before doing so, I must state my conviction that it is impossible to arrive at any sharply defined classification of consumption. The principal pathological states met with in the *post-mortem* room are due to, firstly, inflammatory processes of different degrees of intensity, and whose products may vary greatly in power of vitality; secondly, to infective processes giving rise to irritation of the lymphatic system, and consequent hyperplasia of the adenoid

[1] Pulmonary Consumption.

tissue. The question whether a lung contains tubercle or not, is simply, whether infection of the lymphatics, local or general, has taken place; and this is often very difficult to determine; but we must remember that in by far the greater number of consumptive cases tubercle does form; and it is rare to examine the body of a patient who has died of phthisis without finding tubercle in his lungs, or that increase of the fibroid element which is now regarded as in many instances but the past tense of tubercle.

The principal forms of phthisis that I recognise are:—

1. Acute tuberculosis.
2. Acute phthisis.
3. Scrofulous phthisis.
4. Phthisis arising from pleurisy, pleuro-pneumonia, or pneumonia.
5. Catarrhal phthisis.
6. Hæmorrhagic phthisis.
7. Laryngeal phthisis.
8. Chronic tubercular phthisis.

A glance at this list will show that the arrangement is not purely pathological, but partly pathological and partly clinical, setting forth the principal features by which different groups of consumptive cases may be distinguished. Between all these

groups links can be found; and in many cases, in process of time, a case classed under one heading may develop features which render it more suitable for some other group, as no hard and fast line of demarcation exists between them.

Our climate cases have one factor in their histories which forbids their including either of the first two groups, acute tuberculosis or acute phthisis; viz., that each patient had been at least one year under observation. Acute tuberculosis, as we know, is fatal in a few weeks, and must, therefore, be put out of our category. Acute phthisis, or what many authors call scrofulous pneumonia, is characterised by rapid consolidation and excavation of the lungs, accompanied by high pyrexia, alternating with chills and intense night-sweats, by persistent and distressing cough, and by abundant and opaque expectoration; also by rapid wasting; and, from the acuteness of its symptoms, it much resembles pyæmia, and rarely lasts many months. Though prolongation of life does occasionally occur in this form, no examples of it are embraced in our present list.

Twelve of our patients were instances of *scrofulous* phthisis; and in these the disease was preceded or accompanied by scrofulous affections of one or more joints, by caries of the ribs, sternum, or vertebræ, by

psoas or lumbar abscesses, or by induration and caseation of some group of lymphatic glands, whether cervical, axillary, bronchial, or mesenteric; or, lastly, in some by fistula. This class of cases is generally a favourable one, the progress of the disease being slow, owing to the various diverticula which exist, to protect the lungs from some of its virulence.

Fifty-two cases, or about one-fifth of the whole, were traceable to attacks of pneumonia, pleuro-pneumonia, or pleurisy, in which perfect resolution had not taken place; but a certain amount of consolidation or thickening remained behind, and acted as a source of local irritation, thus in time giving rise to the formation of tubercle.

The principal clinical features were persistence of cough after the inflammatory symptoms had passed away, wasting, shortness of breath, with pain, and some flattening of the affected side; the lung-disease was generally unilateral, and considerable displacement of organs often occurred. Under this heading is classed the curious collection of cases known as fibroid phthisis, which, for a long time after its recognition by Dr. Andrew Clark, was denominated by some 'chronic pneumonia,' by others 'cirrhosis of the lung;' but, in my humble opinion, this group is clearly marked out, by clinical features and patho-

logical products, as a variety of consumption, though, as a rule, its origin is inflammatory and therefore it has been classed with others of like origin.

The patients included, too, forty-eight instances of *catarrhal* phthisis, being one-fifth of the whole number. By catarrhal phthisis I mean cases where the disease can be distinctly traced to attacks of bronchitis, whooping-cough, or croup, which have given rise to catarrhal lobular pneumonia, a form of consolidation difficult of absorption, on account of the preponderance of the epithelial element remaining behind unresolved. The patients never quite lose their cough; and after a while begin to waste, and to expectorate opaque matter in large quantities. The lungs are at first resonant, excepting a few scattered patches of dulness; and the auscultation-sounds, in the early stage, are hardly to be distinguished from bronchitis; but, after a while, the observer detects the ominous croaking rhonchus, and finds he soon has to listen to undoubted cavernous gurgle. I know of few cases in which cavities appear to form so quickly.

Four of the patients belonged to that interesting class described by Dr. C. J. B. Williams and myself under the title of *hæmorrhagic* phthisis, and by Dr. Peacock as *hæmoptysical* phthisis. They are not to

be confounded with Niemeyer's 'phthisis ab hæmoptoe,' where the presence of blood in the smaller bronchi is said to set up caseous pneumonia; but the distinguishing features are the occurrence of very copious hæmoptysis, with very little cough and but slight physical signs; its recurrence from time to time, the patient enjoying tolerable health in the intervals, and the detection, after a while, of consolidation generally in the interscapular, scapular, or suprascapular regions; cough, purulent expectoration, wasting, and other symptoms of phthisis supervening. This is one of the forms which in time sinks into the ordinary chronic consumptive case.

One patient was an instance of laryngeal phthisis with ulceration of the larynx, and some tuberculisation of the lungs. Among the remainder, in two, the disease came on after enteric fever; in three, after confinements or miscarriages; in one, after injury to the chest-wall; in two, after deformity of the thorax.

No fewer than 126 were examples of the most common form of consumption, chronic tubercular phthisis; and the large preponderance of this ordinary form of the disease is of great importance, as it shows that these patients were not selected rarities or clinical curiosities, but fair instances of the terrible

complaint against which we most of us have to contend daily to the best of our ability.

Hæmoptysis was present, in varying degrees, in 131 patients; that is to say, in 53·91 per cent.; and in two cases was fatal.

It seems to me that this will be a sufficient outline of the principal features in the histories of these patients to enable us to form some idea of their general state, and more details would only be irksome; so let us now pass to the state of the lungs.

State of the Lungs.—The condition of the lungs immediately before and after the patient underwent climatic treatment has been carefully noted, and the principal results are tabulated (Table II.). Without troubling you with all its details, I will draw your attention to the leading facts. Of the 243 patients, 149 were in the first stage; *i.e.*, in 61 per cent., or three-fifths, tubercular consolidation of the lungs was detected; of these 54 had the right lung affected, 39 the left, and 56 both lungs affected. This carries out the law, based on my previous larger statistics, that the right lung is more liable to attack than the left. Thirty-eight patients were in the second stage, the right lung alone being affected in 11; the left alone in 14; and softening being present with consolidations in 13. Thus, 15½ per cent. of the

patients were in the second stage. Excavation was present in 56, or 23·06 per cent.—nearly a fourth; the right lung being excavated in 23, the left in 31, and double cavities existing in 2 patients. Here, again, we find well demonstrated the now recognised law of the left lung being more prone than the right to excavation. As regards unilateral or bilateral affection, we may cite that, of the whole 243, 96 had both lungs affected, and in 147 only one lung was attacked.

Summing up, we must bear in mind that three-fifths of the patients were in the first stage, and two-fifths in the second and third stages; also, three-fifths had one lung attacked; two-fifths had disease in both lungs. The patients passed one or more winters at one of the British coast stations, as will be seen by the accompanying list. (*See* Table III.) Twenty patients spent 20 winters at Bournemouth; 6, 11 winters at Brighton; 6 spent 7 in the Channel Islands, on the picturesque shores of Jersey and Guernsey; 57 passed 75 winters at Hastings; 3 spent 4 between Worthing and Bognor; 1 passed a winter at Queenstown, Cove of Cork, a well-known warm retreat, one of the first that catches the Gulf Stream influence; 58 spent 79 winters in the Undercliff (Isle of Wight), either at Ventnor or Bonchurch,

TABLE II.—*State of Lungs in 243 Consumptive Patients who Wintered at Home-stations.*

	Patients		State of Lungs before wintering at the Health-station	State of Lungs after wintering at Health-station							Summary		
				Cure and Decrease	Stationary	Advance	Advance and Extension	Extension	Unknown *	Worse †	Improved ‡	Stationary	Worse
		Per ct.									Per ct.	Per ct.	Per ct.
First stage .	149	61·31	54 had the right lung alone affected 39 „ left „ „ 56 „ both lungs affected 149	58	32	20	17	13	9	50	41·42	22·85	35·71
Second stage .	38	15·63	11 had the right lung alone affected 5 the right in 2nd stage & left in 1st 14 the left lung alone affected 5 the left in 2nd stage & right in 1st 3 both lungs affected 38	14	3	15	—	3	3	18	40·00	8·57	51·43
Third stage .	56	23·04	13 had the right lung alone affected 2 „ right in 3rd st. & left in 2nd 8 „ right in 3rd st. & left in 1st 16 „ left lung alone affected 15 „ left in 3rd & right in 1st 2 had both lungs in 3rd stage 56	18	15	10	5	3	5	18	35·30	29·41	35·30
Total . .	243		Totals . .	90	50	45	22	19	17	86	39·82	22·12	38·05

Right lung alone affected in 78 (32·10 per cent.). Left lung alone affected in 69 (28·40 per cent.).
Both lungs affected in 96 (39·50 per cent.).

* Unknowns excluded in percentages. † Under Worse are bracketed 'Advance,' 'Advance and Extension,' and 'Extension.'
‡ Under Improved are included 'Cure' and 'Decrease.'

and for convenience I have classed these together as Ventnor, there being no important difference between them in climate; 3 spent 11 winters in Cornwall, for the most part at Penzance; and 114 wintered in various parts of Devonshire, of whom 100 spent 153 winters at Torquay, 1 wintered at Ilfracombe, and 13 passed 24 winters in parts of South Devon, such as the coast towns of Dawlish, Teignmouth, etc., excluding Torquay.

Thus, 386 winters were spent at various sanitaria by 268 patients, or rather by 243 patients, as 25 of them spent winters at more than one health-resort, and are therefore duplicates. This gives an average of 1·44 winters per patient. By the term winter I mean a period of at least three of the coldest months of the year, though, with the great majority, it includes five or six months, the usual period being from October to April.

A glance at our list shows that, at the places included, the invalids were not likely to have suffered from want of nutritious food or good medical advice, both articles being abundant in these places, and probably the food supply of a better quality and more suitable for invalids, than is to be met with out of England. Cod-liver oil was ordered to all these patients, and was taken regularly by the majority,

but by forty it was ascertained to have been taken irregularly. The general treatment was of the sustaining character now in vogue in this country, combined with such an amount of counter-irritation as local exacerbations justified, and of palliative measures in the form of sedatives, as the cough rendered necessary. The tonics chiefly used as a vehicle for the oil were the various mineral acids, phosphoric, nitro-hydrochloric, sulphuric and nitric, combined with vegetable bitters, such as strychnia, quinine, calumba, quassia, cascarilla, gentian, and orange. A few of the patients took hypophosphites of soda and lime, and I cannot discover that these improved more than the others; but I take this opportunity of correcting an error which appeared in the work of an author whose name is closely connected with the use of hypophosphites, to the effect that the increased duration of life in the statistics of consumption, published by my father and myself, was due to the use of hypophosphites. The number of patients taking them, compared with the whole number, was so insignificant as not to affect the statistics one way or another.

I may mention that, since this climatic treatment, 45 of the 243 patients are ascertained to have died.

And now we come to the results of the climatic

treatment, which must be considered under two aspects: *general*, that is, the effect on the patient's general health, on appetite, digestion, sleep, cough, strength, colour, respiration, temperature, pulse, and weight; *local*, the effect on the lungs.

The general results have been arranged in four classes, and are sufficiently indicated by the terms used—1. Much improved; 2. Improved; 3. Stationary; and 4. Worse. We find that out of the 243 patients 66 were much improved, 94 were improved, 18 were stationary, and 65 were worse. Expressed in percentages, the results were

Much improved...27·16	} = 65·67	Stationary.. 7·41	
Improved .....38·51		Worse .....26·74	

Thus, we see that 65·67, or nearly two-thirds, improved, only 7½ per cent. remained stationary, and rather more than a quarter deteriorated. The general results must, on the whole, be considered satisfactory.

Now for the local results. These are included under six classes, and are arranged in Table II. First, as to *cure or decrease* of disease, it was hardly thought necessary to make a separate arrangement for cures, *i.e.*, absolute arrest; and we have therefore mixed them with 'decrease,' this indicating that

the physical signs of disease are perceptible over a smaller area of the lung. *Stationary* implies that the physical signs remained much the same as they were before climatic treatment. *Advance, extension,* and *advance and extension*, all speak for themselves. The table shows us a total of 90 decrease, 50 stationary, 45 advance, 22 advance and extension, 19 extension, 17 unknown; or, counting advance, advance and extension, and extension as 'worse,' we arrive at a total of 86. Excluding the 'unknown,' and expressed in percentages, the improved were 39·8; the stationary, 22·12; and the worse 38 per cent. This forms a marked contrast to the changes in general health, and demonstrates only too faithfully how all the appearances of an improved state of health may be present, and yet the disease may continue its insidious and steady march unchecked. We have 40 per cent. of locally improved, against 65 per cent. generally better; and 38 per cent. worse locally, against 26¾ generally so. The moral is, that we must not trust too much to general appearances, and that an opinion to the effect that the patient has improved must not be given unless a very careful examination of the chest confirms it. The extension of disease does not seem to have proceeded very rapidly, for we find that only 41 of the 243 showed

extension, whereas, as has been indicated, 67 showed advance. As regards each stage, 41½ per cent. in the first stage improved, 40 per cent. in the second, and 35 per cent. in the third; 22 per cent. in the first stage remained stationary, 8½ per cent. in the second, and 29 per cent. in the third. The first stage shows 35 per cent. worse, the second 51 per cent., the third 35 per cent. The first stage has, therefore, as might be expected, the largest number of improved, and the third the smallest; the second, as we might predicate of a shifting condition, has the smallest number of stationary, and the largest of worse.

Having briefly stated the general and local results of these 243 cases, we may now consider the individual health-stations, as given in Table III., and see how our patients fared at each. Take the general state first. Now, I am sorry to say that the numbers are too small to enable us to draw deductions about all the localities, but it will be seen that 20 wintered at Bournemouth, 57 at Hastings and St. Leonards (these towns being, for the sake of brevity, classed as Hastings), 100 at Torquay, and 58 at Ventnor (including Bonchurch); and with these numbers we can deal in percentages, as I have shown in Table III.,

TABLE III.

	Patients	Winters	Average of Winters	Local Results									General Results						
				Cure and Decrease	Stationary	Advance	Advance and Extension	Extension	Unknown *	Improved †	Stationary	Worse ‡	Much Improved.	Improved	Stationary	Worse	Improved	Stationary	Worse
										Per ct.	Per ct.	Per ct.					Per ct.	Per ct.	Per ct.
Queenstown . .	1	1	—	—	—	1	—	—	—	—	—	—	—	—	—	1			
Cornwall . . .	3	11	3·67	2	1	—	—	—	—	—	—	—	1	2					
South Devon . .	13	24	1·87	7	2	3	—	—	1	—	—	—	4	7	—	2			
Torquay . . .	100	153	1·53	35	18	19	10	8	10	39·00	20·00	41·00	19	41	10	30	60	10	30
Ilfracombe . .	1	1	—	1	—	—	—	1	—	—	—	—	—	1					
Channel Isles . .	6	7	1·16	2	2	1	—		—	—	—	—	1	4	—	1			
Bournemouth . .	20	20	1	7	7	3	3		—	35	35	30	6	7	2	5	65	10	25
Ventnor . . .	58	79	1·36	23	9	10	3	8	5	43·40	16·98	39·62	17	23	4	14	68·96	6·89	24·13
Worthing and Bognor	3	4	1·33	1	—	—	—	1	1	—	—	—	1	1	—	1			
Brighton . . .	6	11	1·83	2	1	2	1		—	—	—	—	1	3	1	1			
Hastings . . .	57	75	1·31	24	14	9	2	5	3	44·45	25·92	29·62	23	18	3	13	71·93	5·26	22·80

* Unknowns excluded in percentages. † Under Improved are included 'Cure and Decrease.'
‡ Under Worse are bracketed 'Advance,' 'Advance and Extension,' and 'Extension.'

which, I am afraid, may prove a little hard to understand, but will repay study.

First, we come to Bournemouth, where 20 patients passed 20 winters; 6, or 30 per cent., were much improved; 7, or 35 per cent., improved, 2 remained stationary; and 5, or 25 per cent., became worse. Thus, 65 per cent. improved, and 25 per cent., or one quarter, deteriorated.

What of Hastings? Here 57 patients passed 75 winters, 23 being much improved, 18 improved, 3 stationary, and 13 becoming worse; or, in percentages, 72 per cent. were improved, $5\frac{1}{4}$ per cent. remained the same, and 22·8 per cent. were worse.

Torquay had 100 patients for 153 winters, and of these 19 improved much, 41 improved, 10 were stationary, and 30 worse; *i.e.*, in percentages, 60 per cent. improved, 10 per cent. remained the same, and 30 per cent. became worse.

Lastly, Ventnor had 17 much improved, 23 improved; *i.e.*, a total of 40 improved, 4 stationary, 14 worse; or, in percentages, improved 68·96 (nearly 69) per cent.; stationary, $6\frac{3}{4}$ per cent.; and worse, 24 per cent.

Now, these are remarkable figures. Hastings stands by far the first in this list, both in large percentages of 'improved' and in small number of

'worse.' Next comes Ventnor, then Bournemouth, and, last of all, Torquay, which in the 'improved' list, falls short of Hastings by 11 per cent., and of Ventnor by 9 per cent.

Bear in mind that these general results assign the largest amount of benefit to the most easterly stations, and follow a course exactly the reverse to that of the warmth of the localities; Hastings, the coldest, being at the top of the list, and Torquay, the warmest, being at the bottom.

Now for the local changes. Excluding 'unknowns,' the Bournemouth patients showed local decrease of disease in 7, a stationary condition in 7, and advance or advance and extension in 6. This gives us roughly 35 per cent. improved, 35 per cent. stationary, and 30 per cent. worse.

Hastings gives decrease in 24, stationary condition in 14, advance of disease in 9, extension in 2, and advance and extension in 5. Arranged in percentages, this gives us 44½ per cent. improved, 26 per cent. stationary, and 29½ per cent. worse. Torquay shows 35 instances of decrease, 18 of stationary, 19 of advance, 8 of extension, 10 of advance and extension; or, in other terms, 39 per cent. improved, 20 per cent. stationary, and 41 per cent. worse. Ventnor shows 23 decrease, 9 stationary, 10 advance, 8 ex-

tension, 3 advance and extension; or 43 per cent. decrease, 17 per cent. stationary, and 39½ per cent. worse.

Now, these local results differ slightly from the general ones. In number of 'decrease' cases Hastings comes out first, then Ventnor follows closely after, and, separated by a long interval, comes Torquay, Bournemouth bringing up the rear. In percentages of 'stationary' cases Bournemouth, as might be expected from the small numbers of decrease, stands at the top of the list. Next comes Hastings, followed by Torquay and, lastly, Ventnor.

In the category of 'worse' Hastings has the smallest number, Bournemouth next, Ventnor comes after, *longo intervallo*—there being a difference of 10 per cent.—and Torquay is last. It will be remarked that here, too, excluding Bournemouth—which, owing to the smaller number of cases, does not afford us such satisfactory data as the others—the result is, *the more westerly the station the greater the number of 'worse.'* What deductions, then, may we draw from the combination of the general and local results? And here the greatest caution is necessary, and the only safe path to pursue in the cause of impartiality and truth is not to go an inch beyond what the facts justify. Whatever these de-

ductions may be, I can conscientiously say that they were arrived at after careful and disinterested study of facts, accumulated without any special object of proving or disproving theories. The cases were taken by Dr. Williams and myself, and, as may be seen from the account of them, were not specially selected, but were such as occur daily in physicians' practice, and, moreover, the climatic treatment was not always in conformity with our advice, but had frequently to be adjusted to private considerations, whether of purse, family, or the convenience of the patient.

The following deductions may be drawn. Torquay[1] was locally and generally the least beneficial of the four health-stations, then came Ventnor and Bourne-

[1] The statistics of the Western Hospital for Consumption at Torquay have been kindly furnished by Dr. Strangways Hounsell, and are on the whole confirmatory of my cases, as regards their general state, for out of 1,010 patients (542 males and 468 females) admitted during fifteen years, each residing for six months and upwards, 68 per cent. improved (generally) and only 20 per cent. became worse. The increase in weight in the 'improved' was often very large. I have only been able to compare the *general* state, as the *local* state in these hospital patients is not sufficiently clearly recorded to make a comparison with my cases possible. When this is done—and from what Dr. Hounsell says there seems every probability of a careful register in future—the statistics will be of great value, as they include patients from various parts of England, contributed by the different counties.

mouth, with so little difference between their results, taking into consideration the smaller data about Bournemouth, that we are not justified in placing one before the other; and we must, therefore, bracket them, as is done in the Cambridge Triposes. Hastings was decidedly the most beneficial in regard to local and general improvement.

The question naturally arises, can this disparity of result not be accounted for by the nature of the cases? Were the worst patients sent to Torquay, and the most promising ones to Hastings? I need not remind the Fellows of this Society how difficult it is to make a comparison of cases of consumption where a small amount of local mischief may coexist with great constitutional disturbance, and when, *vice versâ*, with a large amount of lung-consolidation, or even excavation, the general health may be very little affected. Nevertheless, I have made some attempt to arrive at a relative estimate of the cases before undergoing the climatic treatment, taking as a basis the nature and origin of the disease in each, according to my previous classification, as well as the condition of the lungs.

TABLE IV.—*Nature of the Disease in the Patients Wintering at the subjoined Sanitaria, expressed in percentages.*

	Inflammatory (Pneumonic)	Catarrhal	Chronic Tubercular	Scrofulous
Hastings . .	21·52	21·52	54·37	1·90
Ventnor . .	22·41	15·51	58·62	
Bournemouth	35·00	15·00	35·00	15·00
Torquay . .	19·00	23·00	46·00	7·00

We find that, comparing the patients sent to Torquay with those who wintered at Hastings, in each case nearly half of them trace their disease to inflammation of various kinds; but that rather more catarrhal origin was traced in the Torquay cases, against a preponderance of pneumonic or pleuro-pneumonic origin in the Hastings ones. Also a few more of scrofulous origin went to Torquay than to Hastings, where there was a larger number of the ordinary chronic tubercular kind. So, after all, the difference is quite unimportant, as cases of scrofulous origin have a better prognosis than the average chronic tubercular, though catarrhal phthisis is not quite so favourable as phthisis following pneumonia.

As regards the nature of case, the Ventnor patients closely resembled the Hastings ones, but counted a few more of the ordinary chronic type. On the other hand, the twenty Bournemouth patients differed considerably from the rest; the proportion of phthisis

arising from pneumonia and pleuro-pneumonia, and of scrofulous origin, being larger, while that of ordinary tubercular phthisis is smaller. So, considering the ascertained prognosis of the two first classes, these patients ought to have done better; but let us see what light the state of the lungs throws on these differences :—

TABLE V.

	First Stage	Second Stage	Third Stage	Both Lungs affected
	Per cent.	Per cent.	Per cent.	Per cent.
Bournemouth	60·00	15·00	25·00	55·00
Hastings . .	57·62	18·64	23·72	40·67
Torquay . .	61·76	16·67	21·56	38·23
Ventnor . .	62·06	15·51	22·41	37·93

The above (Table V.) shows the patients at the four sanitaria, classified according to the stage of the lung and the circumstance of one or both lungs being affected. We see that the largest percentage of first stage cases was at Ventnor, and the smallest number was at Hastings; that the largest number of second stage patients was at Hastings, and the smallest at Bournemouth; in the third stage category there is no marked difference; but Bournemouth has slightly the largest number, and Torquay the smallest. In the matter of having both lungs affected Bournemouth is far the worst, Hastings being the next, and Torquay and Ventnor having about the same percent-

age. The general impression derived from a study of this table is, that the worst cases as regards state of the lung went to Hastings, the next to Bournemouth, and the most favourable to Torquay and Ventnor, the patients at these latter places not differing much. Therefore, on the whole, taking into consideration the double affection, the worst cases went to Bournemouth and the next to Hastings. Torquay and Ventnor had the most favourable ones.

It is evident, therefore, that we cannot explain the contrast in results between Hastings and Torquay on either of these grounds, and I am not aware of any other ones which could be adduced. If the fault did not lie in the patients, it should be sought for in the place. We know that at all these places good food and accommodation are equally obtainable. At all of them medical men of eminence and ability reside, and we may be quite sure that whatever assistance the science of medicine can render to arrest disease or to assuage suffering was equally at hand at all these sanitaria. The questions of drainage and water-supply, important though they be, do not bear specially on our enquiries, because, as far as we know, none of these patients suffered from those diseases which arise from or are aggravated by defects of drainage or by impure water.

We discussed the doctrines of immunity from phthisis at some length in the last Lecture, and it would be interesting to bring this theory to bear on our present statistics. This, owing to the laborious and enlightened labours of Mr. Haviland, is an easy task; for, in his beautiful map representing the geographical distribution of phthisis among females in England and Wales, the relative phthisis mortality of the various districts in which these health-stations are situated is depicted; and we find Bournemouth among the districts where the mortality is highest; viz., 37 to 40 deaths from this cause in 10,000 living. In the second class, where the deaths are 33 to 36 per 10,000, Hastings comes; while in the fourth class, where the deaths are only 25 to 28 per 10,000, stand both Ventnor and Torquay; this being below the general average mortality of England from this disease.

If, therefore, the immunity ground stood good, we should expect better results from sending our patients to Torquay and Ventnor than to Bournemouth and Hastings, an expectation quite unwarranted by our statistics.

Soil does not throw any great light on our enquiries, as, although it has been proved by Dr. Buchanan that phthisis prevails more on impermeable

than on permeable soils, none of the places under our immediate consideration are distinctly situated on clay.

Torquay is shown by Mr. Pengelly to stand on slate and limestone, surrounded by hills composed of red sandstone and conglomerate.

Bournemouth is famous for its great depth of sandy soil, extending in parts at least 50 feet downwards, though in the narrow valley in which runs the river Bourne some clay is reported to be present; but the general character of the soil is essentially dry and permeable.

Ventnor, in the Undercliff, according to Dr. Scoresby-Jackson, is situated on a very permeable soil. Geologists state that this side of the Isle of Wight consists in the upper part of chalk and marl, overlying green sand, dark marl, and ferruginous sand. We know that the action of water on this marl has formed it into mud, much of which is therefore washed away, and the green sand and chalk, being left without support, fall down, and in this way have been formed the picturesque terraces called the Undercliff.

At Hastings the Wealden clay is overlaid with sand to a sufficient extent to render the soil dry,

and the cliffs behind the town are for the most part composed of Hastings sand.

Therefore, all these soils are more or less permeable, though, perhaps, that of Bournemouth enjoys in this respect the pre-eminence.

Torquay has no suspicion of clay about it, and its rocky nature affords every facility for ample surface-drainage.

By the process of exhaustion we are brought to purely climatic phenomena for the explanation of our differences of results, and we will now consider these phenomena.

Torquay is situated in a corner of Torbay, whose beauties have been compared, and not unjustly, with those of the Bay of Naples and of Porto Ferrajo, in Elba; the promontories on each side of this bay completely protect the district from westerly and easterly winds, while the distant range of Dartmoor and a series of intervening hills form a sufficient bulwark against northerly blasts. The series of hills over which the town is scattered, viz., the Warberry, Park Hill, and Warren Hill, besides affording protection, provide sites for villas with the most varied aspects and elevations. This feature has been utilised. The well-built villas which bespangle their sides, each in its own garden, and generally fulfilling the

sanitary requirements of an invalid residence, appear to offer an almost perfect winter asylum. Mr. Vivian's tables teach us that Torquay has the highest winter temperature in England, and, excepting Penzance, the greatest equability. Though situated in a somewhat rainy county, Torquay has a small average rainfall and a moderate number of rainy days. The Dartmoor range attracts much of the rainfall which would naturally come to the share of Torquay—a fact realised, to their cost, by our valiant autumn campaigners when they encamped on the moors of that wild district!

The scenery of Torquay is very exquisite, combining the mingled attractions of mountain, sea, and woodland beauty, and its mild climate has made it the resort not only of consumptives from England and the Continent, but also of numerous aged persons, many of them of our own profession, to whom the avoidance of extremes, especially of severe cold, means length of days.

The mean winter temperature is 44° Fahr., its range being 29°. The rainfall in winter (three months) is 6·82 inches, distributed over thirty-five days.

Bournemouth is more open to the sea than Torquay, and far less sheltered to the north and east;

its protection being chiefly derived from distant hills, and from the fine grove of fir-trees which surround the villas on every side, imparting fragrance to the air without increasing the damp of the atmosphere. Here the mean winter temperature is 42·38° Fahr. The annual rainfall is 28·9 inches.

Ventnor is built on a series of steps facing the sea, and open to the south, south-east, and south-west winds, though sheltered from all other winds by the lofty downs, which rise 500 to 700 feet immediately behind the town. The mean winter temperature is 41·81° Fahr., the range being 29°. The winter rainfall is 4·65 inches, divided among thirty-nine days.

Hastings and St. Leonards may be described as the most 'blowy' of these four places; the two towns are backed by an efficient screen of cliffs which protect from the north and north-east; the old town of Hastings nestles among the hills, while St. Leonards is extended along a narrow strip hemmed in against the sea by the more or less precipitous ridges. This town, as well as part of Hastings, is exposed to a certain amount of east wind. The mean winter temperature is 39° Fahr., with a range of 33° Fahr. Rain falls on thirty-nine days in winter to the amount of 7·59 inches.

It would be superfluous for me to describe further those places which are known to most of you, and about which so much has been published; recently they have been well described, especially in their health aspects, in a recent admirable series of articles in the *Sanitary Record.*

Comparing the health of the patients during their stay at these four watering-places, I find that at Torquay a larger proportion lost appetite, and from bilious or other derangements of the digestive system were unable to persevere in the use of that most important drug—cod-liver oil. I also find that diarrhœa was more prevalent here.

At Hastings, on the contrary, as a rule, the appetite improved; cod-liver oil was taken regularly, and diarrhœa was a less frequent symptom.

Before closing a word should be said about the other stations, which have not furnished sufficient numbers to yield percentages for comparison. The six patients who passed eleven winters at Brighton yielded as general results four 'improved,' one 'stationary,' and one 'worse,' and locally a decrease of disease in two, a stationary condition in one, and a worse one in three. Of the six Channel Islands patients only one deteriorated generally, and two

locally. The three Cornwall ones who spent eleven winters there all improved generally, and did not lose ground locally. The thirteen South Devon patients, other than those at Torquay, did fairly well, having only three locally and two generally 'worse' at the end of the time. The single cases at Queenstown and Ilfracombe hardly call for any remark; nor do the three patients who spent four winters at Worthing and Bognor.

Do not the facts, on which we have been dwelling, permit us to infer that in the treatment of consumption a bracing though gusty climate avails more than a mild, still, and somewhat relaxing one? and that, instead of seeking for a sedative atmosphere to allay the cough and reduce irritability, we should in most cases select a stimulating one to increase the appetite and to invigorate the systems of our patients? And what is it that renders the western end of the British Channel less beneficial in climate to consumptive patients than the eastern end? We may infer that it is the stronger influence of the Atlantic warm current and its accompanying winds on the shores of Devonshire and Cornwall, which, though it raises their winter temperature many degrees, clothing their hillsides with verdure, and causing what

would otherwise be waste places to bloom with rare exotics, deprives them of the stimulating and bracing influence which is possessed by the less beautiful shores of Sussex, with its breezy downs and colder winter climate.

LECTURE III.

FOREIGN CLIMATES AND THEIR RESULTS ON CONSUMPTION.

In the last Lecture we discussed at considerable length the climatic results of the British Channel sanitaria on consumptive patients; and I should greatly like to treat the chief foreign health-stations in the same manner, but their number renders this impossible. It will, I think, be more useful if we take a practical survey of the foreign climates most in vogue, and examine briefly their respective merits. The limited time will forbid my entering into detailed particulars, and I must crave pardon if I seem too dogmatic; but I am prepared to substantiate every statement from a broad basis of facts. There are many climates of which I have no results, and it will be more in accordance with the plan laid down if I do not at present dwell on these, but first discuss those of which I have results. To classify all foreign

TABLE VI.—SHOWING INFLUENCE OF FOREIGN

			Results		
			Winters	Patients	Much Improved
Calm inland temperate climates (moist)		Arachon	1	1	—
		Pau	74	43	5
		Bagnères de Bigorre	2	1	1
		Rome	22	18	4
Dry climates of the Mediterranean Basin (Marine)	Riviera	Hyères	35	23	4
	Riviera	Cannes	39	19	6
	Riviera	Nice and Cimiez	20	18	6
	Riviera	Mentone	24	12	2
	Riviera	San Remo	8	3	—
	Riviera	Riviera generally	9	7	1
		Malaga	10	8	2
		Ajaccio	1	1	—
		Palermo	1	1	—
		Malta	2	2	1
		Corfu	1	1	—
		Cyprus	2	1	—
		Algiers	4	4	—
		South of Europe generally, including winters spent partly at one and partly at another of the above stations, or else in travelling in Italy, Spain, &c.	73	52	16
Very dry climates		Egypt and Syria	26	20	6
		Cape and Natal	13	9	1
		Tangiers	11	3	2
Moist and warm Atlantic climates (Marine)		Madeira	102	63	14
		Canaries (Teneriffe)	1	1	—
		St. Helena	1	1	—
		West Indies	16	5	1
		India (generally)	30	10	7
		New Zealand	19	4	—
		South America (Andes)	1	1	1
		Sea-voyages to Australia, America, India, China, Cape, and West Indies	45	18	7
			593	350	87

ATES IN CONSUMPTION IN 251 CASES.

Results				Percentages		
Stationary	Worse	Average No. of Winters per Patient		Much Improved and Improved	Stationary	Worse
2	20	—	. . . . .	50·00	4·55	45·45
—	—	1·70				
2	6	1·23		55·56	11·11	33·33
6	4	—				
3	4	—				
3	1	—	Riviera (82 patients) .	58·23	20·73	20·73
2	5	1·64				
2	1	—				
1	2	—	Mediterranean Basin (100 patients) . .	58·00	21·00	21·00
2	—	1·56				
1	—	—				
—	1	1·51	South of Europe and Mediterranean Basin, &c. (152 patients) . .	62·50	20·39	17·10
1	—	—				
—	—	—				
—	1	—				
—	2	—				
5	10					
5	2	1·30	. . . . .	65·00	25·00	10·00
2	3	1·34	. . . . .	58·62	24·13	17·24
9	20	1·61	. . . . .	53·81	14·28	31·91
—	1	1·71	Moist Atlantic Islands (70 patients) . .	51·43	14·28	34·29
—	—	—				
1	3	—				
—	1	3·00				
1						
		2·36	Average of winters per patient.			
		2·50	Average of voyages per patient	89·00	5·50	5·50
1	1					
49	88					

sanitaria is a very difficult task; and beyond an outline sufficient to give some of the leading features of the meteorology, such as dry and moist climates and a few others, I shall not attempt to elaborate. Therefore my classification must be looked on as provisional, and not final, for it is to be hoped that some day we may be able to point out distinctly the specific element of each climate.

In Table VI. I have placed a list, taken from my paper in the fifty-fifth volume of the *Medico-Chirurgical Transactions*, which will serve as a text for my sermon, and supply us with facts enabling us to judge of the various sanitaria. Two hundred and fifty-one consumptive patients spent one or more winters at one of these sanitaria; 190 were males and 61 females. Family predisposition was present in 52 per cent., and hereditary predisposition in 28 per cent. Eleven were cases of scrofulous phthisis, 55 originated in pneumonia and pleuropneumonia, 41 originated in bronchitis, 2 originated in syphilis, and 6 were instances of hæmorrhagic phthisis. Hæmoptysis was present in 62½ per cent. As regards the state of the lungs, 61 per cent. were in the first stage; 21½ per cent. were in the second; 17½ per cent. in the third. Sixty-

seven per cent. had one lung attacked, and in 33 per cent. both were involved.

These facts will give us a rough outline of the cases on which the results of foreign climates are based. The table is arranged, not, as in my first Lecture, under two headings, local and general, but a careful examination was made of these conclusions, and a balance struck as accurately as possible in the form of a single report. I confess this is not so satisfactory a procedure as the separate classes, but it is more intelligible, and will bring me sooner to the end of my story. Now let us examine the individual groups.

Calm Inland Climates with a certain amount of moisture have an excellent example in Pau, a health-resort with some remarkable meteorological features. It stands on elevated ground, facing south, towards the magnificent range of the Pyrenees, with the uplands of Les Landes of Pont-Long in the rear. The town is situated on gravelly soil, well drained; it has a lower mean winter temperature than Torquay or Penzance, a considerable rainfall, and a large number of rainy days. The chief characteristic of the climate is stillness; the leaves often do not move for long periods together, while the rain—and there is plenty of it—falls perpendicularly. Of old times,

it was stated to be specially suited for *erethric* phthisis, whatever that may mean; but, as most of the so-called cases of erethric phthisis are acute forms of the disease, such are generally unfit to send away from home: and this must, indeed, be a wonderful climate if it will arrest cases of acute phthisis.

Whatever may be its climatic peculiarities, the results on forty-four patients during seventy-six winters are seen under the headings of *improved*, *stationary*, and *worse*. Fifty per cent. improved; 5 per cent. remained stationary; and 45·45 per cent. became worse. Compared with the rest of our list Pau shows the smallest number of 'stationary' and the largest number of 'worse.' Now these are simple figures, but their publication in France, where my paper on foreign climates was circulated in a translation by Dr. Nicolas Duranty of Marseilles, has caused a great deal of excitement, especially at Pau, and has brought some abuse on my head. But all seekers after truth must be prepared for marked opposition, if, in the course of enquiry, facts come out which are unfavourable to vested interests; and it is not unnatural that the inhabitants of each locality, who know little of others, should stand up bravely for their own, even when the evidence of figures is strongly against them. For the patient

observer the best motto will be, *Fiat justitia, ruat cœlum*, and he must calmly pursue his investigations.

Looking at the above figures, it is impossible to hold the favourable views formerly held about the climate of Pau, as the drawbacks appear to be of a character which interferes considerably with the hygienic life of an invalid, these being the large number of rainy days, the large rainfall, and the low mean winter temperature. The feature which commends itself most to pulmonary invalids is the wonderful stillness of the Pau atmosphere, which is a strange contrast to that of Nice, Cannes, or Hyères on a mistral day, or to some of the British south coast stations when the south-wester blows. It is in spring that the great advantage of this quality is felt, and Pau may often be used as a refuge when other health-resorts are too hot or windy.

Another inland climate which had formerly a great repute is Rome, though for many years its unfitness as a shelter for invalids has been recognised, and it is now mainly resorted to for pleasure and not for health; it is exposed to all winds, has a mean winter temperature of 48°·2 Fahr., a large rainfall, and is situated in the midst of a malarious plain, the evil effects of which show themselves most in summer, but to a certain extent in winter and spring, as is too

often experienced by enthusiastic but unwary sight-seers, who linger after sunset among the tombs of the Appian Way, and suffer accordingly.

When, however, the grand system of drainage of the Campagna, as inaugurated by Garibaldi, has been effected, some amelioration may be looked for; but, considering the size of the plain and how small a portion of it is inhabited, few of the present generation can expect to see the day when Roman malaria will be a dream of the past. And there are other perils for the invalid in the form of cold and draughty palaces to be explored, icy museums and picture galleries, sunless and well-like streets, all combining to render Rome a dangerous place of residence, except for those in robust health. Eighteen patients passed twenty-two winters there and yielded the following results: 55½ per cent. improved, 11·11 per cent. remained stationary, and 33·33 became worse; which results, contrasted with some others, which will be referred to later, are far from favourable.

Madeira was formerly the *beau-idéal* of a residence for phthisical invalids, who in this balmy, sedative climate seemed to forget their sufferings and breathe afresh. It has a winter mean temperature of 60°·6 Fahr., twelve or nineteen degrees higher than any of the Riviera resorts, a rainfall of 20 inches in

88 days, and a warm moist atmosphere singularly soothing to coughs. Dr. Walshe states that so damp is the air, that boots become covered with mould, lucifer-matches cease to be inflammable, and iron rusts easily.[1] A good many results have been published about Madeira, the majority of them being unfavourable. Dr. Lund gave favourable ones, for his 100 cases showed 47 cases of arrest; whereas, of Dr. Renton's 47 cases of undoubted phthisis, 32 died in six months after arrival, and the rest shortly afterwards.[2] Of the 20 Brompton patients who were sent to Madeira, only 3 derived benefit, 1 died, and the rest returned home worse than they went.

Our table shows that of 63 patients who spent 102 winters, 53·81 per cent. improved, 14·28 remained stationary, and 34·29 became worse. This is the second worst sets of results on the page, and makes us cease to wonder at the desertion of Madeira by the medical profession. Other moist warm cli-

[1] These phenomena have been questioned by Dr. Dyster and Dr. Lund, the latter admitting, however, some dampness at the sea-level. The hygrometrical observations do not show a high degree of absolute humidity, but the comparison of the climate with the very dry group of Egypt and the Cape justify the title of warm and moist.

[2] Dr. Renton's other tables are appended, but the particulars are so scanty that Table I., which I have quoted, is the only one affording much information. Table IV. does not appear to relate

mates seem to furnish unfavourable results, as the Canaries and St. Helena; and the five patients who spent various winters in the West India Islands, the climate of which is hotter than that of Madeira, yield even more unfortunate ones. Madeira appears

to cases of phthisis, and Table II. gives no account of the state of the patients who 'left the island' or remained in it:—

TABLE I.—*Cases of Confirmed Phthisis.*

Died within six months after landing	32
Went home in summer: returned and died	6
Left the island: of whose death we have heard	6
Not since heard of: probably dead	3
	47

TABLE II.—*With Tubercular Lungs.*

Died here	30
Left the island.	22
Still here.	4
	56

TABLE III.—*Incipient Phthisis.*

Left the island much improved	26
Improved, but not since heard of	5
Have since died	4
	35

TABLE IV.—*Threatened with Pulmonary Disease.*

Remained free from symptoms	93
Fell off	13
Lost sight of	2
	108

Dr. Lund's figures do not greatly differ from my own, but my cases were slightly more favourable. His 'favourable' results of the Madeira climate do not compare to advantage with those of other sanitaria.

to me to fail entirely in the stimulating qualities of sea-air which render Hastings and Brighton so bracing, but its soft air serves as a species of linctus to the cough, and supplies an atmosphere easily breathed by those with irritable bronchial membranes. The symptoms of which the patients who became worse most complained were diarrhœa, languor, and loss of appetite; and, in many cases, the oil was not taken regularly. Some of the patients, who did improve, did so to a remarkable extent, cavities closing and the general health recovering in a very rapid manner; and these patients were generally those who were able to live in the higher part of the island and took horse-exercise. Still we must bear in mind, in the case of Madeira, as in all the other groups, that in all climates cases of phthisis have recovered; only it is a matter of study—aye, and of very careful study—to determine what kind of climates have yielded the best results, and to gauge the evidence in favour of each. For one form of the disease—viz., the catarrhal, to which allusion will presently be made—Madeira seems admirably suited, although less so for the ordinary type of consumption.

The West Indies have been classed with Madeira in spite of their winter temperature being far higher, and their presenting many climatic peculiarities,

such as the large rainfall and the terrible tornadoes, which are not participated in by Madeira. Five patients spent 16 winters in Jamaica, Barbadoes, and Cuba, and, with the exeeption of one cavity case, were all first stagers, and the disease generally was of catarrhal origin. They fared rather worse than the Madeira ones, though they all had the advantage of a longer to-and-fro voyage. The invalids who did best here lived in the hill country of Jamaica, which has a high reputation among Americans as a sanatorium.

I witnessed a striking example of the good influence of these highlands in a young medical man who consulted me in February 1872. He had a brother suffering from scrofula, and had lost two paternal uncles from phthisis. He was in practice at Helston, in Cornwall, and rather hard-worked, and had suffered from cough for two winters, which had been persistent for five months. He had been wasting for two years, and was much prostrated by the effects of a severe accident to his eye, after which he had night-sweats and evening pyrexia ; in a word he presented the symptoms of early phthisis ; and on examination I found consolidation of the upper half of the right lung, with evidence of active disease proceeding.

In the following July he went to Jamaica, and resided in the Blue Mountains, at an elevation of 4,000 feet. In this beautiful climate, which he described as eternal spring, he lost his cough in three months, and undertook a very active life as medical officer of a large district, which involved riding for twelve hours daily. He returned to England last November, and I had the pleasure of examining his chest, and I was surprised to find no trace whatever of his former disease. He appeared the picture of health, and had gained several pounds in weight. He never took cod liver-oil for any length of time, and so we must credit the largest share of his improvement to climate and climate alone.

In connection with the causation of phthisis by climate it may not be irrelevant to mention two remarkable instances in natives of the West Indies which have lately come under my notice. The first was a young lady born in Jamaica, of white parents, who were healthy, but she had a sister who was a leper. She first came over to England at the age of nearly 14 for education, and a few weeks afterwards was attacked with obscure lung-symptoms, for which I saw her with Mr. George Gaskoin, and which developed into tubercular consolidation of the greater part of one lung, with excavation. The second case

was also a young lady, aged 13, born in Jamaica, whom I saw in consultation with Mr. Bezly Thorne. Her family were free from suspicion of consumption, and she had enjoyed excellent health till shortly after landing in England, when she was attacked with cold, cough, expectoration, and wasting; and, when I saw her a month after the manifestation of the first symptoms, she had profuse sweats and signs of active phthisical disease in the right lung. Both these patients were nearly perfectly developed young women, although under 14 years of age, and had the appearance of having grown too rapidly, but both had been quite healthy before landing on our shores, and had previously complained of no loss of appetite or of strength; so we must conclude that their growth and development were of too rapid and exotic a character to stand transplantation to our more treacherous climate. The advice given in both instances was to return to their native island.

Let us now turn to the Dry Mediterranean Group, and consider its climatic features. This inland sea, with its narrow entrances to the Atlantic and the Black Sea, and now through the Suez Canal into the Red Sea, presents many peculiarities which distinguish it from the neighbouring Atlantic Ocean, and which powerfully affect the climate of its shores. 1.

It has scarcely any tide. 2. It is much salter than the Atlantic. 3. Its waters contain less free oxygen and more carbonic acid (Carpenter). 4. It is much warmer than the portions of the Atlantic lying between the same latitudes; and, moreover, its warmth is less influenced by the seasons. The temperature, at a depth of 20 to 30 feet, throughout the winter, has been found to be from 54° Fahr. to 60° Fahr., and bathing is indulged in all the year round.

The principal cause of all this is the existence of a submarine barrier of rock, extending from Cape Spartel to Cape Trafalgar, in the Gibraltar Straits, and reducing the depth in this portion of the sea to 167 fathoms. By this, according to Dr. Carpenter, the cold polar current, which descends along the Atlantic coast of Spain and Portugal, is shut off, and does not penetrate to lower the temperature of the Mediterranean depths.

The saltness of the sea is usually attributed to the comparatively small number of large rivers which empty themselves into it, and which cannot supply the immense volume of water which is lost by evaporation, due to the sun's powerful influence in these latitudes. Thus is necessitated a supply of water through the Straits of Gibraltar, which takes the form of a superficial current, the depths of these two seas being

separated, as I before noticed, by the rocky barrier.

What we have to do with, as climatologists, is the warmth of this inland sea and its equalizing influence, by which the temperatures of its northern and southern coasts are, to a certain extent, assimilated, and its shores clothed with palms, oranges, lemons, Japanese medlars, and other subtropical vegetation, which seem to flourish in proportion to their proximity to its warm levels.

The sea lies between 30°·15 and 40°·50 North latitude, and, of course, considerable thermometric differences are to be found between the two shores, though this is very much reduced by the large body of warm water separating them.

The first characteristic of the Mediterranean climate is dryness; the second, its stimulating qualities; and the third, its moderate warmth; the combination of which characteristics appears to act favourably on consumptives from the North.

No fewer than 152 of our patients passed 229 winters on the shores of this sea, either halting at one spot or travelling about; 82 wintered in the Riviera; 8 spent 10 winters in Malaga; 2 spent 2 at Malta; 4, 4 winters in Algiers. A single winter was spent by a patient at Ajaccio, Palermo, and Corfu,

while one patient wintered at Cyprus. Fifty-two were, during 73 winters, travelling about in Spain, Italy, and the South of Europe generally.

The results of this climatic treatment of the whole 152 cases is very satisfactory: 62·50 per cent. were improved, 20·39 per cent. remained the same as when they set out, and only 17·10 per cent. became worse: one of our best results.

This large group admits, however, of certain subdivisions; and as one of these may be mentioned the climate of the tract of country extending from Toulon to Spezzia, and sheltered more or less completely from the north by the various ranges of the maritime Alps. The parts lying between Nice and Spezzia are called the Eastern and Western Riviera, though the term is sometimes applied to the whole district. Within it are the well-known sanitaria, Hyères, Cannes, Nice, Mentone, Bordighera, San Remo, Nervi.

Its southern exposure and the protection from northerly winds give it a warmer mean temperature in winter than many parts of the adjacent Italian peninsula. The winter mean varies from 47° Fahr. to 49° Fahr.; the rainfall is about 25 inches, and the number of rainy days from 45 to 80. The climate of the whole region is dry, as hygrometrical observations

show, and there is abundant sunshine throughout the winter, enabling patients to live much in the open air. But, in spite of the northern screen, this region is subject to occasional visitations of cold weather, of which we often read complaints in the newspapers; and every winter brings round its series of grumbling letters from invalids who have left their homes in search of summer, and who find, after all, but a modified winter, bright and cheerful, it is true, but still necessitating winter clothing and warm wraps. And herein lies their mistake; for if our invalids could indeed find a lotus-eater's land,

> In which it seemed always afternoon,
> All round the coast the languid air did swoon,

I would predict that the results on their health would be rather pernicious than otherwise, and loss of appetite and diarrhœa would probably be induced.

The real advantage of the Riviera climate is the combination of the bracing element with dryness, sunshine, and moderate warmth; and this first quality can hardly be supplied without a certain number of days of mistral, or a certain percentage of cold weather. This is as necessary to the maintenance of the appetite as the warm air is beneficial to the cough and other local symptoms.

Many opinions have been expressed as to the

relative advantages of the Mediterranean health-stations, and it is amusing to hear the patrons of each vaunt it and decry the others; but the fact is, that there is not such a very great difference between any of them. Mentone and San Remo are probably the most sheltered from north winds; but they are consequently the least bracing, while Cannes and parts of Nice are the most so. The real distinction which should be taken into consideration is, first, whether a place be situated on the sea, or lie at a distance from it; and, again, whether the protecting ranges are close to or at a distance from the town; for, while the sea-shore ensures greater equability of temperature, it also ensures a large amount of stimulating influence, sufficient at times to preclude sleep, and to excite unduly the nervous system; on the other hand, a few miles inland means greater extremes of temperature, although generally sounder sleep and more repose of the nervous system may be reckoned on. Hyères, Cannet, and Cimiez belong to the less stimulating class, and Mentone, Cannes, and Nice to the more stimulating. Our 82 patients who tried the Riviera climate give as results 58½ per cent. of improved, 20¾ per cent. stationary, and 20¾ per cent. worse; a good result, but not so good as that of the whole 152 wintering in the South of

Europe. Still, it must be remembered that the difference is made up by the favourable results given by those patients who were able to travel from place to place, and, therefore, were probably not so advanced in disease as those limited by their doctors' orders or their own wishes to one health-station.

Besides the Riviera patients, 8 spent 10 winters at Malaga, and, though a small number, returned excellent results, the whole of them becoming better or remaining *in statu quo*, and testifying to the benefits of that beautiful climate, which, if it were not for the unsanitary state of the town, would probably eclipse the Riviera in the estimation of invalids, from its greater dryness. The winter mean temperature is 56° Fahr.; the rainfall is only 16½; the number of rainy days is 40.

A few of the patients spent winters in some of the Mediterranean islands—Sicily, Cyprus, Malta, Corsica, and Corfu—which all appear to have a much warmer climate than the Riviera, but are open to winds and storms. Algiers is placed on the Mediterranean, but local reasons give it a somewhat different climate from the other sanitaria. It is moister and warmer, and this comes about from the Atlas mountains attracting a large annual rainfall. Looking at the dryness of the south-eastern corner

of Spain, it always appears as if Algeria, in the battle of the elements, had secured to itself the rainfall lost by Spain, as the contrast between the almost arid eastern coast of Spain and the well-watered provinces of Constantine and Algiers is very striking. The mean winter temperature, according to Dr. de Pietra Santa, is 56° Fahr., the amount of rainfall 32 inches, and the number of rainy days 87. The prevailing winds are the west, north-west, and east (from the Mediterranean quarter); of these the westerly bring moisture from the Atlantic. The chief drawback to the climate is the fact that the rainfall takes place principally in the winter, the summer and autumn being the dry seasons.

Since making out these statistics I have come across my notes of a young lady of strong consumptive predisposition, who went to Algiers three years ago for the winter, with a considerable-sized cavity and great emaciation. She has passed three winters there, taking cod-liver oil, and living in a villa in Mustapha Supérieur, with the greatest possible benefit. I have examined her each year on her return home, and have watched a gradual improvement in general and local signs; and last spring, to her and my great satisfaction, after examination of the lungs, I failed to detect any trace of the cavity. She has

become very stout, lost her cough, and is wintering this year in England fairly well. Before we quit this part of Africa, I may allude to Tangiers, where three of the patients spent eleven winters with great benefit. There some of the Atlantic influence is felt in the form of cool westerly breezes; but, at the same time, this does not appear to increase the rain-fall or the number of rainy days, neither of which is large. Recently, a well-known Fellow of this Society has called attention to Mogador, on the Atlantic coast of Morocco, as a fitting resort for consumptives, and has published some good tables illustrative of the climate; but, as I do not attempt at present to give accounts of all good climates for consumption, but merely analyse those of which I have practical results, I cannot now dwell more fully on this and other climates, which I hope may each in turn have a trial, and be found in certain cases to be of especial benefit.

We now come to the *very dry climates*, which include the Cape, Natal, and Egypt. The two former have moist and stormy summers, but their winter climates are dry, and we therefore class them with Egypt.

Now, Egypt is the type of the dry climates, and especially so is the Desert, through which the Nile boat-travellers wend their way to the Second Cataract.

The rainfall is very small, and the number of rainy days rarely exceeds fifteen in the year. Mr. Flower, in his excellent papers in the *British Medical Journal* of 1874, states that, during that winter, when more rain fell than had been known for years, there were 11 rainy days out of 150, and in some of these but a few drops fell. The mean winter temperature is 58°·52 Fahr., and the range of temperature is greater than on the Mediterranean shores; but it is very rare for the freezing-point to be reached, even at night. Heavy dew occurs there, and the early mornings and the nights are cool and refreshing. As a general rule, Mr. Flower says, the days are very much like one another, fine, clear, bright, and sunny, and the subject of the weather, so important in our island home, soon loses its interest from being devoid of change.

The main object of a visit to Egypt is not to stop at Cairo, although its climate has been found useful, and in certain cases it is preferable, from greater comforts and medical advice, &c., being obtainable, and living arranged on a more economical scale for those whose means are limited. Nor is it to spend time at Ismailia or Suez on the famous canal. Invalids should generally ascend the Nile in a dahabeah; and it is this voyage up 800 miles of

river, flowing, for the most part, through desert, that is fraught with such benefit to the phthisical. The boats contain fair-sized and airy cabins, are well stocked with good food, and most of the comforts which an Englishman can desire are obtainable, while they halt sufficiently often to allow proper exercise and rambles on shore. The patient is spared all fatigue, and supplied with the pure dry air of the Desert, his mind being perpetually occupied by a succession of objects of interest offered by the glorious monuments of the past and by the picturesque and remarkable studies of present life in Egypt. Such are the conditions under which patients are now generally placed, though I am afraid our tabulated patients were not all so fortunate. However, the results are that, out of twenty patients who passed in Egypt twenty-six winters, 65 per cent. improved; 25 per cent. remained stationary; and 10 per cent. became worse. This is by far the finest land result we have to offer. It is to be regretted that the great expense of the trip to Egypt and the ascent of the Nile puts this mode of treatment beyond the means of many patients.

The few patients who wintered either at the Cape of Good Hope or at Natal seem to have been less prosperous; for, out of the nine patients, who

were chiefly first stage cases, and belonging to no special variety of phthisis, four improved, two remained stationary, and three became worse. These numbers are evidently too small to enable us to pass judgment on the climate of this part of Africa; and unfortunately I have no results from Bloemfontein,[1] which has been highly spoken of by Dr. Symes Thompson.

Among the miscellaneous climates, it may be noted that India gives good results; but we must not forget that, of ten patients who resided in various parts of the country, six were in the first stage, and only two in the third. One of these, who had a very large excavation in one lung and some consolidation in the other, lived for upwards of ten years, and during the greater part of this time did active duty as a colonel of a regiment in a hot part of India, also engaging in field sports, including tiger-hunting.

Twenty of our list made trial of voyaging in

[1] Since these Lectures were delivered I have seen two first stage cases which have improved wonderfully from a sojourn at Bloemfontein. One, a young man aged 20, of a very consumptive family, went to Bloemfontein with well marked disease of one lung, a severe cough and wasting, lost his symptoms, and proceeded to the Diamond Fields, where he made a large fortune and returned home after two years' absence, I examined his chest and could detect no signs of disease.

various parts of the world; and these, with the exception of one female, were all males under forty years of age; the number of voyages was nearly fifty, for I have added two more patients to the list since that table was constructed. As regards the nature of the cases, six originated in inflammatory attacks, two in bronchitis, four were of the ordinary chronic tubercular form, two were scrofulous, one hæmorrhagic, and one asthmatic; 72 per cent. were in the first stage, 11 per cent. in the second, and 16⅔ per cent. in the third stage. One patient voyaged to China and back; three went to and fro between America and the West Indies and home; three went to the Cape or Natal and back; one patient took trips in the Indian Ocean; eleven journeyed between Australia, New Zealand, and England; and in most cases the voyages were repeated several times.

Those who went between the West Indies and our own islands showed good *general* results, but *locally* did worse than the rest of the number. The longer voyages were of most use to the patients, only one of those who visited Australia and New Zealand becoming worse, and he had returned overland by India. All the others improved vastly in general health, and, with the exception of two, exhibited diminution in the local disease. One gained as

much as twenty pounds in weight during the outward voyage.

The results of these sea-voyages are that 89 per cent. of the patients improved; $5\frac{1}{2}$ per cent. remained stationary; and $5\frac{1}{2}$ per cent. became worse. This is the most favourable of all our climatic experiments; and it is for this reason that I propose dwelling more at length on the conditions under which a phthisical invalid is placed during a voyage for the sake of health.

Of all sea-voyages, the one to Australia or to New Zealand is the most to be commended, and it has largely come into fashion of late years. The start is usually made about the end of October or the beginning of November in a fine sailing vessel, and Melbourne or Wellington is reached in about three months. A month or two are spent on shore, and the return to England takes place by summer time.

With the kind help of my friend Captain Toynbee of the Meteorological Office, I have carefully perused the logs of several sailing vessels bound to and returning from these countries at various seasons of the year, and the following are the chief facts which bear on our subject. When a vessel leaves England in the beginning of October, the temperature ranges from 52° Fahr. to 58° Fahr. for the first five days.

Off the Azores, it rises to 60° Fahr. On passing the Canaries it reaches 70° Fahr. When the good ship crosses the equator, the maximum, namely 80° Fahr., is attained; but this, thanks to the wind always blowing, is not oppressive, or even unpleasant. The heat then moderates, and in 29° south latitude 70° Fahr. is about the average; and, steering south to the Cape, it falls to 60° Fahr. After rounding this, the temperature becomes for a time very uncertain, varying from 49·5° Fahr. to nearly 60° Fahr., the cause being the meeting of the cold currents from the Antarctic Circle and the warm Agulhas current. These overlapping each other form a series of strata, which in places run side by side and affect the air considerably, causing changes in the temperature, which have to be met by many precautions on the part of invalids. The ship then reaches 45° south latitude, and steers due eastward, the thermometer ranging between 40° Fahr. and 50° Fahr., owing to the nearness of the Antarctic Circle. When 70° east longitude is attained, the temperature remains steadily above 50° Fahr., and gradually rises to 66° Fahr. on nearing the Continent of Australia. Thus, we see the degrees of warmth vary from 40° Fahr. to 80° Fahr.

I have not noted the course of the winds, for the

vessel mainly sails before them, and the invalids are spared some of the discomforts of a head-wind which in steamers at times causes much annoyance.

Captain Toynbee tells me that observations on the hygrometer show that the difference between the wet and dry bulb varies from 2° to 5°, which, when we consider the high temperature of some portion of the route, is a very small one, and indicates a large amount of moisture to be present in the air; for we must remember that in the South of France, at the same period of the year, this instrument often shows a difference of 10°.

When the voyage is attempted in summer, the patient generally starts in May, arriving at his destination in August; and the thermometrical observations do not differ greatly from those of the October voyage. It is 62° Fahr. off the Azores; 70° Fahr. on nearing the Canaries; 85° Fahr. on crossing the equator; 70° Fahr. on reaching 26° south latitude; 60° Fahr. on rounding the Cape; and, after passing through the region of change and steering eastward, 50° Fahr. is the average without any rise on reaching Melbourne, where the patient lands in midwinter.

Neither of these trips exposes the passengers to any great perils from vicissitudes of temperature;

and, though the weather may be rough at times, he is generally on deck during the greater part of the day.

The return voyage from Australia or New Zealand is fraught with more dangers, as a study of more ships' logs and the histories of some of the patients show. This is because the course of the vessel lies past Cape Horn, and keeps farther south and nearer the Antarctic Circle than is done on the outward trip. A ship leaving Wellington in April, when the temperature was 55° Fahr., for the first week enjoyed an atmosphere of 50° Fahr.; and, when 50° south latitude and 137° west longitude was arrived at, it fell to 40° Fahr.; and off Cape Horn to 38·40°; and here it was that one of our cases lost ground by catching a fresh cold. For twenty-eight subsequent days, the thermometer ranges from a few degrees above 40° Fahr. to a few degrees below this figure, the wind being south from the icy regions. This is assuredly a wretched state of affairs for our consumptives. In 40 south latitude, a rise to 50° Fahr. is observed; in 35 south latitude, to 60° Fahr.; and off Monte Video 70° Fahr. is marked; at the line, 80° Fahr. is recorded; and at the Azores it is about 70° Fahr.; and the British shores are reached in mid-July warmth.

It is noticeable that the climate of the Atlantic and Pacific does not seem to vary much with the

season, whether the voyage be undertaken in spring or in autumn, though it may make a great difference whether the invalid arrive at our antipodes in their midsummer or their midwinter; and again, the season when Cape Horn is rounded may be of great importance.

The less southward a vessel goes on the return voyage the better, as in very cold weather snow and sleet and hail are often encountered.

The average number of rainy days cannot be stated, as, of course, they vary with latitude and other causes; at least twenty should be reckoned on.

Of course, there must be a certain amount of monotony on board-ship, with the same daily round of occupations and meals, only varied, it is said, by flirtations and by quarrels.

The beneficial effect on consumptive patients does not begin, according to Dr. Maclaren, for the first week or two; but, as the weather becomes warmer, the cough lessens, and the irritability of the system subsides. Improvement in the appetite soon commences, and the gain of weight is most apparent when the cooler latitudes of the southern hemisphere are reached. Dr. Maclaren is disposed to regard the influence of the voyage, before the south-east trades are encountered, as sedative, but afterwards the

tonic element, in the form of the gradually cooling atmosphere and the strong fresh breezes, predominates and continues until Australia is reached.

An invalid seated on the deck of a fine clipper built ship in a southern latitude, say 27° S. latitude, is placed under some of the best hygienic conditions possible. He breathes the purest of air, experiences at any rate one form of passive exercise, without fatigue or fear of chill: he is supplied plentifully with good food in fair variety, for which he has an appetite outstripping even the continued succession of meals.

But when he retires to his cabin, and if he should be confined to it by bad weather or illness, the conditions are surely somewhat changed; he has to live in what, in his own house, would be considered a cupboard, and but a poorly ventilated one, especially when dirty weather requires the portholes to be closed; he is jolted about by every motion of the vessel, and not improbably is tormented by sea-sickness. It must be conceded that this view of the picture is not a cheerful one, and contrasts unfavourably with the quiet nights in lofty bedrooms which are obtainable in land sanitaria.

Mr. Lennox Browne's capital monograph on *Australia for the Consumptive* contains a valuable

chapter of hints for the voyage: how to choose a cabin and make it comfortable, and avoid unnecessary disagreeables.

I will now give as illustrations two marked instances of benefit accruing from this form of climatic treatment in severe but greatly differing cases of consumption.

A medical man, aged 37, consulted me in September 1868, complaining of cough and loss of flesh since February. He had been overworked in town practice, and nine weeks previously had hæmoptysis to the amount of a half-pint, followed by a smaller quantity a few days later. Night-sweats and loss of appetite came on, for which he was sent to Margate. I found more or less dulness over the whole right front, with absence of breath-sound and bronchophony in the lower fourth; tubular sounds were audible at and above the right scapula, with some crepitation under the clavicle. He was recommended to persevere with the cod-liver oil, which he had commenced taking, to use iodine locally, and make a voyage to Australia. He accordingly took an appointment as surgeon on board an Australian clipper, and spent two years in voyaging to and fro; during this period his weight increased from 9 st. to 10 st. 12 lbs; his cough greatly diminished, and he became well enough to resume his arduous town duties. In

December 1874 he had congestion of the right lung; and in February 1875 he was examined by my father and myself, with the following result. Flattening and slight dulness were found over the upper third of the right chest; scattered crepitation was most marked in the mammary region. He had become quite stout and somewhat short-breathed, and complained not of cough or of pulmonary symptoms, but of intestinal disturbances, and asked our advice as to entering the holy estate of matrimony.

A gentleman, aged 21, consulted Dr. Williams in April 1861. Towards the end of the previous year he had had an abscess near the rectum, which left a small fistula; and, after much anxiety during that winter, he suffered from pleuro-pneumonia of the left lung, which was treated by calomel and opium, salines, and repeated blisters. In June the fistula was still discharging, and the patient complained of much loss of flesh and strength, with cough and purulent expectoration; also occasional occurrence of pain in the left side. The physical signs were dulness, deficient motion and breath in the lower two-thirds of left chest; loud bronchophony at and within the left scapula; crepitus on deep breath. He was ordered cod-liver oil, with nitric acid tonic; a saline with opiate at night, and a blistering liniment to the side.

In November he had rapidly improved and gained flesh; but the cough, which for some time he had lost, had returned, and the fistula was still open. Coarse crepitation was now to be heard in the left back, with cavernous sounds over the scapula, although the general dulness had slightly diminished. The treatment was continued, and he went to Madeira for the winter, which he passed pretty well, although once, after fast riding, he spat three ounces of blood; and in April, after catching cold, the cough and expectoration increased. He took the oil regularly, and did not lose weight. In May 1862 Dr. Williams found still much dulness and obstruction in the left chest, with obscure cavernous sounds in the scapular regions, and large tubular sounds above the right scapula. That autumn he took a longer voyage, and passed the winter in Natal and Capetown, returning in the spring *viâ* Brazil. He continued his treatment, became quite free from cough and expectoration; and, when seen in June 1863, was in good flesh and strength. Still he had slight discharge from the fistula. The signs of cavity were more obscure, and some improvement in breath and percussion sounds were detected.

He spent the ensuing winter on the sea, leaving in October for Australia; and, after one month there,

returned home, reaching England in May, and was able to report of himself that he had gained seven pounds in weight. With the exception of slight hæmoptysis at Capetown, he had been quite well the whole time; examination also showed improvement, viz., only loud tubular sounds over the left scapula: some breath-sound, weak in parts, and rough in others on that side. However, he continued his voyages, and again spent two winters on the sea; the first to the Cape and Bombay, and home; the second to Australia and back, still persevering with the oil; and in general health he quite recovered. In May 1866 Dr. Williams found that the patient had gained five pounds; the left chest was still rather duller than the right, and somewhat contracted. Tubular sounds were heard over the scapula; there was a peculiarly dry vesicular breath-sound below, on full inspiration, indicating flaccid emphysema.

He went one more voyage to the Cape as a precaution, but continued in good health, stouter and stronger than ever; and the fistula, though still open and discharging a little, gave no inconvenience. He took oil occasionally; and, when seen in May 1868, was considered by Dr. Williams to be quite recovered, and he had spent the last winter in London without harm. Some years afterwards, he was reported by

his friends to be still quite well, having been for eleven years under observation.

While the voyage to Australia, round the Cape, may be considered one of the most restorative forms of treatment in consumption, the same cannot be said of the other route to Australia, viz., *viâ* the Suez Canal and the Red Sea, for here we have less of the oceanic influence, and consequently the voyage lacks the marked equability of temperature, the gradual and even rise on approaching the equator, and the equally gradual and even depression on leaving the equator; these phenomena not varying to any great extent with the seasons, but affording a safely tempered atmosphere for the invalid to breathe in all the year round.

With Captain Toynbee's assistance I have extracted from the logs of steamers going to Australia, *viâ* the Suez Canal, the Red Sea, and Ceylon, some of the chief thermometrical phenomena.

The route being the same in the two voyages as far as the latitude of Gibraltar, we need not consider the temperature observations before reaching this point.

A vessel on nearing the Rock about the end of October finds the thermometer about 61° Fahr. After passing the Straits, a rise of at least 6° is ex-

perienced, making 67° Fahr.; this increase of heat being due to the influence of the warm Mediterranean basin on the atmosphere. Off Malta it varies from 69° Fahr. to 72° Fahr., and remains at about this height until Port Said is neared. The variations of temperature in the Mediterranean seem to depend chiefly on the direction of the winds; slight rises coinciding with the prevalence of westerly winds, and slight falls with that of easterly.

In the Suez Canal a distinct rise is evident, and 81° Fahr. is often attained, but here, owing probably to the land influence, the temperature is variable and though it rises to 81° Fahr.; it occasionally falls to 66° Fahr. At Suez 84° Fahr. is often noted and about half way down the Red Sea the maximum 86·5° Fahr. is reached. (In summer 98° Fahr. has been recorded here.) At Aden it is from 83° Fahr. to 84° Fahr., but after the vessel has passed the Straits of Babel Mandeb, and entered the Arabian Sea, a distinct lowering takes place, and 79° Fahr. is generally marked. The thermometer records 79° Fahr. to 81° Fahr. during the voyage to Bombay and throughout the rest of the route to Australia, the temperatures do not vary greatly from those experienced in similar latitudes in the Atlantic.

The hygrometrical observations are also worthy

of notice. From England to Gibraltar, and thence to Port Said, the difference between the wet and dry bulb is from 2° to 3°. On entering the Canal the influence of the land makes itself felt, and the difference becomes greater and more variable; amounting sometimes to 6°, sometimes to 8° and 9° and even to 12°, but though generally high, it is by no means invariably so. In the Red Sea it is less, falling to 6° and even 4°, though in midsummer here too it rises to 12°. But when the Straits of Babel Mandeb are passed, and the ship fairly out in the Arabian Ocean, a difference of only $2\frac{1}{2}$° is registered. These observations show that in sending our invalids *viâ* Suez and the Red Sea, we subject them to a hotter and dryer atmosphere, and at the same time one prone to great variations in temperature and moisture, the result in many cases being loss of appetite, diarrhœa, and increased debility. It is therefore highly advisable to select in preference the Ocean route, which ensures equability of temperature by day and night, and a less variable amount of moisture in the atmosphere.

It were well to consider some of the other voyages which are open to the choice of invalids, as, though the Australian one is the most satisfactory experiment, on account of its length, it is a costly

one, and for this and other reasons we are obliged to consider the advisability of shorter ones.

Now, the voyage to the Cape is an excellent measure, as it includes all the best part of the Australian voyage, and avoids some of its disagreeables, viz., the Antarctic current, and the cold weather on nearing that circle. It can be made at any time of the year, though of course it is best if possible to arrange so as to avoid some of our cold weather.

Many invalids undertake the short trip from Liverpool to New York and home again in the summer, and I have seen some good results from the experiment, though of course, as a form of climatic treatment it is less satisfactory than longer voyages.

The temperature ranges from 56° Fahr. to 80° Fahr., being hottest on approaching New York ; and the difference between the bulbs is from 0° Fahr. to 4° Fahr. Occasionally when the vessel comes across icebergs it is far colder, but as a rule the above limits are the summer range.

The atmosphere appears to be of a soothing nature, and medical men who have made the voyage have informed me that it produces marked diminution, and often total disappearance of the cough

in pulmonary cases; indeed, it is rare to find invalids who do not, to some extent, benefit, and I have known even advanced cases with double cavities gain appetite and strength in the short transit.

But to return to our list, we see that in point of benefit received by the patients, sea-voyages occupy the first rank, the very dry climates the second, the south of Europe dry climates the third; then follow the moist climates, viz. Rome fourth, Madeira and the Atlantic warm climates fifth, and at the bottom of the list comes Pau.

Let us see whether any great difference existed in the nature of cases sent to each sanitarium, and examine the table showing the relative conditions of the lungs of each group of patients.

Relative Condition of the Lungs in 251 *Patients Wintering in Foreign Climates.*

	First Stage	Second Stage	Third Stage	Both Lungs
Pau . . .	52·20	34·00	13·60	38·63
Madeira . .	62·85	20·00	17·14	40·00
Rome . .	72·22	16·67	11·11	38·89
South of Europe	58·55	20·38	21·05	35·53
Egypt, Cape, &c.	62·05	27·58	10·34	20·68
Sea-Voyages .	72·22	11·11	16·67	27·78

We find that, as regards number of first-stage cases, Rome and sea-voyages were the best, Madeira and Egypt came next, the South of Europe followed,

and Pau had the fewest. In percentages of second and third stagers, Pau was the worst, the South of Europe the second, Madeira and Egypt about the same (as in the first-stagers); and the most favourable were Rome and sea-voyages, with similar percentages.

Now we come to the question of double affection; and we find that both lungs were affected in 40 per cent. of the Madeira patients, in about 38 per cent. of the Pau and Roman ones, in $35\frac{1}{2}$ per cent. of the South of Europe invalids, in $27\frac{3}{4}$ per cent. of our sea-voyagers, and in only 20 per cent. of the Nile travellers. There appears from this to have been more bilateral affection in the moist land climates than in the dry ones. In point of stage, the cases sent to Pau were slightly the more unfavourable; then came those of the South of Europe, Madeira and Egypt following at a considerable interval; and, lastly, as the most favourable, were the Roman and sea-voyage cases.

Viewing the patients in both aspects (stage and bilateral affection), we may conclude that the Pau patients were slightly the more unfavourable, and the voyage ones decidedly the most favourable; but, as regards the others, there was no great difference: the South of Europe cases closely resembling the

Madeira ones, and being less favourable than the Roman. Thus, beyond improving in a slight degree the character of Pau, and pointing out that the sea-voyages were tried under favourable circumstances, our examination of this table does not modify our verdict with reference to the respective merits of dry and moist climates; and we are bound to conclude that, for the ordinary forms of consumption, a dry air, whether inland or marine, is better than a moist one, inland or marine, cold or hot: always excluding the exceptional instances of sea-voyages.

Before closing my enquiry, I examined the patients at each sanitarium, according to the origin and nature of the disease; and I found that phthisical cases of inflammatory origin did better in the South of Europe than at Pau or Madeira; on the other hand, as regards those of catarrhal origin, Madeira was the most favourable, the South of Europe the next, and Pau the worst. The scrofulous patients seem to have done fairly well in all climates, and not, as might have been expected, to have profited more by a marine than by an inland air.

I have hitherto dealt with the actual results of various climates in phthisis, but although the list of those of which experiment has been made, is a long one, it is by no means exhaustive; and in this wide

world of ours many regions as yet untried may yield good results as sanitaria. Here we pass from the region of fact to that of speculation, and we must therefore use the knowledge already acquired as a stepping-stone in the study of those climates of which we have no experience.

Mountain climates, for instance, cannot yet be said to have been properly tried on Europeans, and it will be well to take a survey and see what places are indicated for this purpose. If we glance at a map of the world, the vast Continent of America, with its great mountain ranges running in a nearly unbroken line from north to south and with its high lying plateaux, appears to offer many sites for elevated sanitaria.

In North America, between 34° and 40° of North latitude, we have the Great Plain separating the many ranges of the Rocky Mountains, and containing the States of Colorado and New Mexico. The Central plain varies in height from 5,000 to 6,000 feet, while the enclosing mountains reach considerably higher elevations, culminating in Pike's Peak, 14,200 feet above the sea level.

The great distance from either ocean seems to ensure dryness of atmosphere, and the climate is represented to be equable and temperate, allowing

even to invalids a completely outdoor life. Access is easy to this region by the Pacific railways, and accommodation is good in the rising towns of Colorado Springs, Cheyenne, Denver, and Santa Fè.

Several of the higher stations on the western slope of the Central Pacific Line have also been recommended, as Tahoe city, opposite the lake of the same name—a lovely spot amidst pine-clad hills and commanding fine views of the mountains, having excellent fishing in the lake, and, the greatest advantage of all, an hotel far superior to what can usually be met with on that line.

Truckee is on the wrong side of the mountains, cold and draughty, while the accommodation is rougher than at Tahoe.

In South America the ranges of the Andes running from 10° North latitude to 45° South latitude, offer a great variety of stations of various altitudes, and, in respect to a choice of sanitaria, two important advantages over other mountainous districts.

First: in the remarkable dryness of the whole of their western slopes and valleys. This is owing to the great inequality attending the distribution of the drainage of the Andes, which appears to be nearly wholly carried down the eastern side of the watershed, thence to issue in numerous streams

flowing eastwards, and combining to form the mighty rivers Orinoco, Amazon, and La Plata, by which the greater part of South America is watered and fertilised.

On the eastern coast we have but few streams, and little or no rain. In Peru, as Guilbert has well described, no rain falls, and the country is watered by a mist. In the north, a tract of country closely resembling the Great Sahara exists, and in this northern desert the soil produces nothing but nitrates of soda and potash, which are the principal merchandise.

This arid condition is entirely due to the want of water, as wherever a spring exists, or where the few mountain torrents can be utilised for irrigation purposes, the banks are clothed with verdure, and vegetation of the richest and most varied kind abounds.

Second: owing to the latitude of the Andes, and to the conformation of the country, every variety of climate is to be found in a comparatively small compass, and the products of the vegetable kingdom at the different altitudes are so various that the fruits of the tropics and cold regions are to be found in the same market. But this is not all. Extensive plains exist at great elevations, scattered over which are found populous and civilised towns, thus removing the mountain treatment from the category

of rough experiments. For instance, Quito, the capital of Equador, stands near the equator at a height of 9,451 feet, Santa Fè di Bogota, the capital of New Granada, at 8,648 feet, La Paz, the capital of Bolivia, at 13,325 feet, and many other places of size are situated at considerable elevations.

Let us briefly glance at some of the most promising sanitaria.

Santa Fè di Bogota, a city of New Granada with 40,000 inhabitants, stands nearly 9,000 feet above the sea level, on a lofty plain 60 miles in length by 30 in breadth, and enjoys a climate resembling that of Malaga. The mean temperature for winter is 59° Fahr., for spring and summer (which appear to form one long season), 59°·5 Fahr., for autumn 58°·1 Fahr., making a mean annual temperature of 59° Fahr., with but few extremes, and as a climate furnishing equability and a moderate amount of warmth, Bogota appears to be provided with excellent accommodation, food, and medical aid, and, being on the road from Quito to the Caribbean Sea, is fairly accessible. *Quito*, a large city of upwards of 80,000 inhabitants, is situated on the east side of Picininchа at nearly 10,000 feet elevation, has been named as a possible sanitarium. It lies surrounded by some of the grandest peaks of the Andes and the most active volcanoes,

and is unfortunately very subject to earthquakes, which have laid it in ruins more than once. Here the temperature the whole year round is as equable as at Bogota, but somewhat warmer, being 60° Fahr., and the climate is described as perpetual spring. Quito is fairly accessible, and boasts good hotel accommodation. It was the scene of the Swiss clockmaker's recovery mentioned on page 21.

In Peru, several localities have been tried with benefit to consumptives. *Arequipa* at about 9,000 feet, with a good hotel, and accessible through its port Camana with the Pacific, has answered in more than one case, but the most noted of all the Peruvian health resorts are *Jauja* and *Tarma*, the former of these having been used by the Peruvian government as a military hospital for consumptives. As this place was mentioned by Dr. Archibald Smith, and has been well described by Dr. Ornellas in his valuable pamphlet,[1] and as I have been able to obtain some very reliable information about the country from private sources, including amongst others the resident engineers of the newly constructed Oroya railway, we will describe the locality somewhat more fully, and first state how it is approached.

The Peruvian Andes consist of two chains of

[1] *De l'Influence du Climat des Andes sur la Phthisie.*

mountains running from north to south with a slight westerly direction, and it is on the eastern slope of the second Cordillera that Jauja is situated. The journey is made partly by rail and partly on horseback from Lima, and lasts three to four days. The Great Andes railway ascends to Oroya, crossing the first ridge at an elevation of 16,400 feet, in one day. On the second day's travel, which is made on horseback, Tarma is reached, and Jauja on the third. Thus from Callao to Jauja is three days' journey, and when the railway is complete it will probably be reduced to two.

On the ascent of the first Cordillera lies *Chosica* at 3,500 feet above sea level and two hours by rail from Lima, which is fast becoming a fashionable resort, on account of its fine climate. It has good accommodation for invalids, but its elevation is hardly sufficient for our purposes.

The valley of Jauja is a plateau 44 miles long and 17 wide, separating the two ranges of Andes, and was evidently in former times the site of a large lake, of which a remnant is still visible in the Lake of Paca. The valley is entirely drained towards the east by the Mantaro, a tributary of the Amazon, as are most of the streams in this portion of the Andes. The soil is alluvial with a calcareous understratum. The year is made up of two seasons, the *dry* season,

which is the coldest, extending from March to August, in which last month frost occurs, and the *rainy* called the winter, which is the hottest, extending from September to February. Thunderstorms occur in January and February, and wind is most felt in July and August. The climate does not admit of great extremes, and the thermometer falls sometimes to 28° Fahr., seldom rising much above 57° Fahr. (in shade). The sun's rays are powerful, and so great is their direct influence, that in the full sunshine the temperature may be 122° Fahr. and in the shade only 50° Fahr. The atmosphere is very clear, partly on account of rapid evaporation, and partly because of the rapid drainage of the valley by the river Mantaro. Iron and steel are stated never to rust, and such is the transparency of the atmosphere, that stars are seen by day. The prevailing winds are south-west in the evening and the north-east in the morning, and occasionally these blow sufficiently to cause a tempest.

M. Zapater gives some statistics of consumptives visiting Jauja. Out of 230 patients, 208 came from the coast, and 22 from the neighbourhood. Of these 20 returned 'cured,' 34 returned 'still ill,' 31 died, (23 coast cases), and 145 remained still under treatment—of these 131 were from the coast, and 14 from

the Sierra. Of the 145, 106 were males and 39 females, and as regards condition of the lungs 46 were in the first stage, 83 in the second, and 16 in the third.

These figures are very incomplete and tell us but little. No statement is given of the condition of the lungs on arrival at Jauja, so that we cannot glean whether the 'cures' were of patients in an early or late stage. Two facts came out in strong relief. First, the greater frequency of phthisis along the coast line.

Second, that the disease does originate among the inhabitants of the mountains, to a less extent, it is true, but that it is not merely an exotic, as Dr. Archibald Smith represented. M. Zapater informs us that the natives of Jauja have the light gait and the enormously developed lungs common to the natives of the Andes generally, and he notes that the climate increases the rate of both pulse and respiration.

The diseases most prevalent are those of the respiratory organs, such as catarrh, pharyngitis, pleurisy, pneumonia, pleuro-pneumonia, and are all marked by an adynamic type. Asthma, goitre, cretinism and yellow fever are unknown, but diseases of the brain and spinal cord are common. *Tarma*, about 20 miles to the north-west of Jauja, has

been used as a sanitarium. It stands at a height of 10,028 ft. in a narrow valley where barley is grown near a running stream. It has a population of 5,000, or 6,000, and a somewhat higher mean temperature than Jauja, though the climate is more variable.

Huancayo, a larger town, 10,718 feet above the sea, lies about 45 miles to the north of Jauja, is well spoken of, and has a climate intermediate in its qualities between the two last-named towns.

Bolivia must not be omitted from our list, as its lofty plateaux offer a considerable choice of stations, and La Paz the capital has been mentioned in these Lectures as the scene of Guilbert's cases of recovery.

It stands 13,500 feet above the sea, possesses a good French hotel, and a dry bracing climate, though it is too frosty for many consumptives.

The transit from England to the Andes region is not so difficult as some think. The best route is *viâ* the isthmus of Panama, by Royal West India Mail Steamer to Colon, thence by rail to Panama and from this point by steamer, of which there are several lines to Callao, the Port of Lima, or to the other ports mentioned. The rest of the journey to Jauja or Tarma has been already described, and probably occupies from London five to six weeks, a much shorter trip than the one to Australia.

The advantages of a sojourn in the Andes are accompanied by the following drawbacks.

1st. The great elevations to which a patient must ascend before the best sanitaria like Jauja can be reached. This amounts often to 17,000 feet, i.e. higher than any mountain in Europe, and in addition to catarrhal and other affections, which the change of climate may induce, the traveller is liable to the soroche or mountain sickness, a painful affection which attacks both man and beast on ascending to these high levels. Its symptoms are pains in the head, giddiness, excitement of the circulation, and respiration, thirst, loss of appetite, nausea, vomiting, and great muscular prostration, but after a short residence they pass away.

2nd. Though the accommodation is tolerable, it is Spanish, and an invalid will have to deal with Spanish habits and Spanish food, both of which are often distasteful to English ideas.

These considerations put the climate out of the reach of a large number of invalids, but there are many young men in the early stage of consumption, endowed with a certain amount of energy and activity and a determination to do what is best, who might be fairly advised to give the Andes a trial, and to place

themselves under the influence of a climate which has yielded most remarkable results.

The great chain of the Himalaya, and the various smaller ranges which border the plains of India such as the Western Ghauts, the Nilgiris, the Pulneys, Shevaroy, the Vindlya, and Aravalli hills have been used for some years as sites for sanitaria for Europeans, civil and military, and much testimony has been given in favour of many of these hill stations. Their altitude varies from 3,600 feet to 8,000 feet, and situated, as they are, in different parts of India, some in the neighbourhood of snowy ranges, others near the sea, and others overlooking extensive plains and marshes, the several groups differing much in latitude, it is evident that the climatic conditions must also vary greatly, as is shown by the subjoined list taken from Dr. Macpherson's admirable report in the *Indian Sanitary Report*, vol. ii.

It will be seen that the Bombay Sanitaria are comparatively of low elevation, and have a mean temperature varying from 61° Fahr. to 78° Fahr., while those in Bengal, situate on the slopes of the Himalaya, rise to 8,000 feet, and show mean temperatures from 35° Fahr. to 87° Fahr.; these have a yearly average much below those in Bombay or in Madras.

The Nilgiri stations, on the other hand,

TABLE OF INDIAN HILL-CLIMATES.

Hill Stations	Mean Temperature in Shade.												Elevation	Rainfall
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		
Darjeeling	40	41	51	55	61	62	63	64	63	55	50	44	8,000	132
Simla	40	44	53	61	66	80	75	78	70	67	52	46	8,000	70
Landour (Kellet 5 yrs)	38·5	38·6	46·16	56·66	63	67·33	63·16	61·61	60·33	54·16	45·33	40·83	7,300	78·44
Murree	—	—	—	—	—	69	68	66	62	62	—	—	6,786	—
Kussowlie	42	47	58	64	77	73	70	70	72	66	—	—	6,400	70
Nynee Tal	42	46	56	61	69	69	67	69	65	61	50	47	6,200	83
Dugshai	42	47	57	64	69	71	72	68	66	62	54	53	6,000	70
Subathoo	—	—	—	77	81	84	79	77	—	—	—	—	4,000	70
Nilgiri range — Ootacamund	54	56	60	61	61	57	63	63	62	56	54	53	7,361	60
Nilgiri range — Kotagherry	59	60	61	63	63	64	65	65	64	62	60	59	6,100	55
Nilgiri range — Wellington	59	61	67	68	68	64	70	70	70	63	61	60	5,840	50
Nilgiri range — Coonoor	60	62	68	68	68	65	70	70	70	65	62	62	5,161	50
Pulneys	51	53	60	61	—	—	—	—	—	—	—	—	7,000	—
Mercara	53	56	61	64	44	66	65	65	64	65	63	56	4,500	100
Shevaroys	65	65	68	71	71	68	68	68	67	66	66	65	5,260	40
Ramandroog	70	76	80	80	75	73	71	70	70	71	71	67	3,400	46
Mahabeshwur	63	65	72	74	72	67	63	64	64	66	64	63	4,700	240
Poorandhur	67	73	77	78	73	70	67	65	67	71	69	64	4,200	73
Mount Aboo	61	61	79	77	77	77	69	69	69	69	69	71	4,015	79

give remarkably equable observations, Ootacamund, Kotagherry, Wellington and Coonoor ranging from 54° Fahr. to 70° Fahr., and varying in height from 5,000 to 7,000 feet.

The differences in rainfall, and, as far as can be ascertained, of appreciable humidity in the atmosphere, are very great. At Darjeeling, where the rainfall is 132 inches, Dr. Macpherson remarks that the rains are almost unabated, and the damp excessive. At Mahableshwur, where is noted the largest rainfall of our list, constant downpours and excessive dampness render the hills uninhabitable for several months of the year. The Himalayan stations in general show large rainfalls, and contrast with the smaller and more moderate ones of the Nilgiris, but this chain is subject to occasional fogs (Macpherson). The Pulney hills station, the most southerly of any importance in India, stands at an elevation of 7,000 feet, sufficiently near to the sea on either side to ensure some of the marine influence, and is thus attached to by Dr. Macpherson. 'During the dry months at inland hill stations, the rapid cutaneous evaporation produced by the rarefied atmosphere, conveys unpleasant sensations unless brisk exercise be taken, but on elevated ranges, within the influence of the sea-breeze, an agreeable softness is communi-

cated to the atmosphere, which being thus equalised, the unpleasant dryness is no longer perceived. This is very perceptible in the Pulney range, which is fully within the reach of the sea-breeze both from the Cochin and Tutacorin coasts.'

The rainfall is small owing to the Western Ghauts and Nilgiris receiving the great bulk of moisture from the Indian Ocean, which the south-west monsoons bring up.

The climate is remarkably equable: the year being divided into two seasons, the cold, similar to the autumn in the South of France, commences in December and ends in March, the remaining months resembling an English summer.

The Nilgiris[1] also seem to present an equable climate, but have far more rain, especially on their western side; the four stations mentioned in the table have been greatly praised as sanitaria.

The Himalayan resorts lie, as a rule, at elevations from 6,000 feet to 8,000 feet, and have a mean tem-

[1] Dr. Sutherland has kindly forwarded me some extracts from an official report on the diseases prevalent among the natives of the Nilgiri plateau, from which it appears that the dominant diseases are of malarious origin, and of the intermittent type. Phthisis and lung complaints are not mentioned as occurring.

The hill-tribes are described as a vigorous and healthy people, contrasting strongly with those of the neighbouring district of Malabar.

perature varying from 40° Fahr. in winter, to 78° Fahr. in summer, a rainy season lasting from June to September and a large rainfall. For the rest of the year they are reported to enjoy a remarkably invigorating climate, though somewhat hotter than that of England. The most easterly is Darjeeling, and the most westerly Simla, and near the latter place lie Kussowlie, Dugshai, and Subathoo. Landour is 100 miles to the eastward, and beyond it is Nynee Tal. The soil at these stations is for the most part a mixture of clay, slate and limestone. At Darjeeling it is clay, the mountains being composed of gneiss with granite cropping out. It will be superfluous to describe all these stations, but as one, viz. Landour, has been fully sketched by Staff Surgeon Kellet, we will presently consider his report, but first notice the opinions held on the use of these stations.

Indian surgeons do not appear to agree about the influence of hill sanitaria on disease; by some they are recommended for hepatic and intestinal complaints, by others they are strongly condemned as only making matters worse, and what is called hill diarrhœa is stated to prevail at some of the stations, an affection which the late Dr. Parkes attributed to unwholesome drinking water and defective sanitary arrangements, but which most Indian surgeons

assign to the check to the perspiration which the cool climate causes to soldiers coming from the hot plains.

Diseases of malarious origin receive great benefit, and the general improvement is visible in the aspect and physical powers of those who have dwelt long in the sultry plains: the appetite increasing, muscular strength is regained, and the sallow tint is exchanged for the natural bloom of health—this being especially noticeable in children.

Curious to say, medical authorities in India are averse to sending cardiac and respiratory cases to the hills, though the grounds of these objections do not fully appear, and may, as Dr. Parkes suggests, be purely theoretical, and connected with the dread of the influence of cold in these complaints; for considering the great stress which is laid upon elevation in the treatment of consumption, by modern authorities in medicine, it is strange that in India, where so much choice of elevation in various latitudes is at command, that medical men have not as yet been unanimous in indicating one or more of the many groups as suitable for chest disease. For most tropical forms of disease a height of from 3,000 to 4,000 feet has been recommended, but as in some instances malaria has been found to drift up to this

height, some authorities prefer localities between 5,000 and 7,000 feet.

From the mere sketch which has been given it is evident that the climatic conditions of these Hill stations differ widely from those of the Andes, where, though the altitude is greater, the temperature is more equable, and the amount of rainfall and atmospheric moisture is considerably less. In fact while the Andes are remarkable for dryness, the Himalayas seem to have more than their share of rain ; and this may account for their being less popular than the former in the treatment of consumption. Many Indian surgeons laid great stress on this feature in the evidence before the Indian Sanitary Commission, and, according to them, the cold damp atmosphere of these stations would be very prejudicial to any cases of lung disease coming from the plains.

Another objection urged against the Himalayan station is the conformation of the country, which consists of more or less precipitous rocks, and deep valleys separating them, the mountain plateaux being small and not extensive enough to admit of abundant exercise for the convalescents.

Many medical men look more hopefully to the Nilgiris and the Pulneys as future sanitaria for

India, as more fitted for invalids who have been accustomed to hot climates.

And now to return to Landour:

It lies on a nearly isolated hill in latitude 20°·27′ N., and longitude 78°·10′ E, surrounded on three sides by vast mountain chains, which rise wave on wave, culminating in the great Gangootry and Jummootry ranges. The rock formation is clay, slate and limestone, and the soil a rich clay, in which luxuriate the oak, the pine, the rhododendron, and other trees and shrubs.

The annual mean temperature is 52°·7 Fahr., the winter 30°·33 Fahr., the spring 55°·27 Fahr., the summer, including the rainy season, 64°·03 Fahr., and the autumn 53°·57 Fahr. The extremes are moderate, ranging from 31°·57 Fahr. in winter and 87° in summer, but the highest or lowest temperatures appear seldom and the usual range is fairly even.

The rainfall is heavy, 78·24 inches.

The number of rainy days is 93. These chiefly occur between June and September when no less than 65 inches fall. The average humidity for the whole year is 61; saturation being 100.

There is but little wind, and this prevails chiefly in February and March, blowing from the background of snowy peaks.

Landour is singularly free from hill diarrhœa, its exemption being accounted for, according to Dr. Kellet, by its position on one long precipitous hill, which is thoroughly washed down by the rains. In this way the evils of imperfect drainage arrangements —a fruitful source of troubles in other hill-stations— are counteracted.

Dr. Kellet's interesting account of the natives is worth quotation.

'In this part of the Himalayas, climate, taken in its widest sense, has produced a small, active, healthy, and brave race of Hill-men, called Paharees. These are for the most part Hindoos, who, except the lowest castes, live on flour, rice, potatoes, succulent vegetables, fruit, &c., which are obtained with difficulty by diligent cultivation of the slopes and terraced sides of the mountains, and of all level spots in the valleys.

'They are wretchedly housed, are filthy in person, homes, and habits, and exist under the worst hygienic conditions, climate alone excepted. When the period for rice cultivation approaches they descend into the valleys, and there contract malarious fevers, the principal affections that assail them.

'But with all the above defects in food, clothing, shelter, and general circumstances of life, there re-

main other climatic conditions, which make the Hill-man healthy and vigorous, and very far superior to his brother of the plains, although there is no original difference in race or colour. When the inhabitants of the plains become located in the hills, they in time acquire the vigour of the Hill-men. The Paharee, in the rice season, suffers as much from malaria perhaps as the residents of many parts of the plain; but when he ascends to his mountain home he shakes off the taint.'

From observation made on these Hill-men, Dr. Kellet found that their respirations were about 19 per minute (compared with 16 per minute, the usual European standard), and that mountain climbing, which very considerably quickened the respirations and pulse of Englishmen, had not quite half the same effects on Hill-men, whose hearts in many instances beat irregularly.

In spite of their unhygienic abodes, Dr. Kellet had never seen among them a case of scrofula, phthisis, scurvy, rickets, or of any complaint indicating a weak constitution.

The most interesting part of the report is the account of the influence of the climate on 29 consumptive soldiers, who passed six months, viz. from April to November, at Landour. With the exception

of one very advanced case, all were in the first stage and many but slightly affected, most suffering from other complaints, the result of hot climates, as ague, dysentery, hepatic disease, as well as phthisis. At the close of their stay 6 had 'recovered,' 4 were 'much improved,' 12 had 'improved,' 6 'not improved,' and 1 was 'worse.' Moreover 13 returned to duty, 15 were permanently invalided, 4 for diseases other than phthisis, and one the very advanced case with double cavities above mentioned, remained at Landour in a rather better state than when he arrived; 18 gained weight, 10 lost, and 1 patient was too ill to be weighed. The gain of weight varied from 1 to 31 lbs., the average being 9 lbs. 3 oz. The losses varied from 1 to 14 lbs. the average being 4 lbs. 8 oz. A curious circumstance was the time when the patients gained weight. This was the period after the rains, as during the rainy season itself they do not seem to have progressed so favourably. The widening of the thorax mentioned by Jourdanet, Walshe, and others as one of the effects of the Andean climate, was well shown in these soldiers. The men increased on an average an inch in the circumference of their chests, the expansion taking place chiefly during the first two months of their stay. Their power and depth of inspiration was also remarkably in-

creased, gradually rising from an average of 1·6 inches on arrival to an average of 2·6 inches on departure.

Now although some of these patients were early and favourable instances of lung disease, and probably, as Professor Maclean justly remarks, not cases of purely tubercular phthisis, for the absorption of the consolidation took place rapidly in several, yet they presented in their history and physical signs distinct evidence of consumptive disease, probably of inflammatory origin, and may be fairly included under the head of phthisis, and it is evident that they exhibited in their persons some of the remarkable influences of high altitudes. Though the elevation was considerably lower than that of Jauja or La Paz, we find a population characterised by a special formation of thorax adapted for high altitudes, with a quicker pulse and deeper respirations, and we see Europeans undergoing certain changes of frame to meet the requirements of the rarefied atmosphere.

Dr. Sutherland, who takes great interest in this question of the fitness of mountain climates for phthisis, suggested to the government an enquiry into the effect of the Indian hill-stations on the respiration and circulation, but it would appear that such an investigation, which required much labour

and careful observation, was not thought desirable, and, therefore, the proposition was declined.

What conclusions can we draw about the hill-stations in India and their fitness for the treatment of phthisis?

I have attempted to state the evidence for and against, but it is difficult to come to any definite conclusion, for on one side we have the opinion of the great majority of Indian medical men strongly expressed, and on the other the evidence of other mountain ranges and Dr. Kellet's facts about Landour. It seems to me, however, that these last merit careful attention from the Indian authorities, with the view of either explaining them, or of furnishing equally full reports about other stations.

Now, from this tangled web of facts and figures which I have woven, I would draw out a few clear rules as to the climatic treatment of consumption.

1. Which patients ought to winter abroad, and which may equally well remain at home?

2. What cases are most benefited by sea-voyages?

3. What patients profit most by dry climates, and how far ought the temperature and elevation to be taken into account?

4. Are moist climates, whether hot or cold, desirable at all for consumptive patients?

1. If a phthisical patient in any stage can take a fair amount of exercise without contracting fresh lung-irritation from exposure to meteorological changes, and if he have a good appetite, with diminishing cough and increasing weight, I should unhesitatingly advise him to remain at home, and trust to treatment and to the food of the best dietary in the world—that of Old England. If, however, he cannot take exercise without constantly catching cold; and if, when confined to the house, he lose appetite, become low-spirited, pine for fresh air, sunshine and change of scene; and, above all, if the confinement act unfavourably on the digestive organs, causing bilious derangements and disinclination to the cod-liver oil, equally unhesitatingly I advise a trial of another climate, if the strength permit. There are a number of consumptives who profit more by food than climate, and never seem to thrive except on British fare. These had better stop at home, and try the sunshine of the south coast.

All cases deemed *advanced*, whether on account of extensive tubercular consolidation of both lungs, or on account of considerable excavation of one or of both lungs, and cases of active tubercular disease; or, again, those manifesting great irritation of the pulmonary or of the gastric mucous membrane, had

better remain in England, as change of climate will not yield them a sufficient return for the alteration of food, life, and habits, as well as the risk of the journey.

Nevertheless, these are often the patients who are most anxious to winter abroad; and even when at death's door, they will not give up their hope that in another and a sunnier clime new life may be vouchsafed to them.

On the other hand, first-stagers, and even where the consolidation is extensive, if the consumptive disease arise from inflammatory and catarrhal attacks, and if it be confined to one lung, do well to leave England; and we may also advise the same to third-stage cases, where the vomica is small and quiescent.

2. As regards the second point, be it remembered that a sea-voyage is a long and trying experiment, to which the invalid has to submit when once he embarks, whether it suit him or not, for several months. In the trip to Australia, there are few halting places, and a patient may die before reaching them. Then, again, the element of sea-sickness must be borne in mind, though, fortunately, consumptives appear to suffer less than other people; and there is also the chance of the invalid being confined

to his berth in case of severe attacks. All these considered, and remembering the character of our patients who profited by the voyages, we must be very cautious in recommending their use, and as much consultation and deliberation should precede a decision as is given by surgeons to a life or death operation.

The cases which I have seen profit most by sea-voyages are, first, cases of hæmorrhagic phthisis; second, cases of limited consolidation with no pyrexia, occurring in young men overworked at indoor occupations, and who have suffered from the septic influences of life in great cities, such as clerks, shopmen, secretaries, and the like. This form of treatment is far better suited for men than for women.

3. As to the third query, as to what class of patients profit most by dry climates, it has been shown that, taking collectively all forms and degrees of phthisis, the dry climates are the most likely to arrest the disease; and also that a dry and moderately warm climate, like that of Southern Europe, is most successful in the treatment of consumption of inflammatory origin. The question whether a cold dry or a warm dry atmosphere is the best for ordinary chronic phthisis depends to a great extent on the

individual's power of maintaining circulation and temperature. When these suffice, the cold climates are preferable; but in the majority, and especially for women, whose circulation is weaker, the warm and dry are the best, for they are thus enabled to live more in the open air. Elevation is of great importance; and I should always choose a mild climate with elevation to one without it. Mountain-air is not beneficial solely on account of its purity, for on this point sea and desert air may vie with it; there is another factor in the low barometric pressure and atmospheric rarefaction, and the expansion of the lungs thereby caused may be of great value in chronic first-stage cases. At present, the trial of mountain climates must depend on the supply of suitable accommodation and food for invalids. If in the Andes sanitaria these articles were of a nature fit to offer to our comfort-loving British consumptives, I would not hesitate, after the evidence of Archibald Smith, Walshe, and others, to recommend them, as some can also boast of a warm winter temperature; but, alas! those who repair thither at present must be content with Spanish habits, Spanish food, and an unsettled government. The Alpine elevated sanitaria do not, according to my experience, supply in winter sufficiently good food for British consumptives; and,

although they attract crowds of Germans and Swiss, they must not expect our countrymen in equal numbers until they feed them properly.

4. As to the desirability of moist climates for consumptive patients, the evidence is decidedly against their use in the treatment of ordinary chronic phthisis. The addition of warmth only makes the damp tell more unfavourably, though a strong saline element and invigorating breezes do something to counteract the humid influence; still even these do not place a moist climate on the same level as a dry one. There is one exception, however. Phthisis, of catarrhal origin, has been shown to profit most by a warm and equable climate, even though accompanied by a certain amount of moisture, as the evidence of Madeira witnesses.

Finally, in all climate questions, full note must be taken of the patient's inclinations, means, and, above all, of his disposition and temperament; and exile must not be decreed to those who are incapable of making themselves happy under the changed conditions of life, or all our scientific grounds for a climate decision may collapse like a house of cards.

Climate is only one portion of the system of attack which we organise against the dread foe which

decimates our population, and would be worth little if not combined with medicine and hygiene, and a determined will to wrestle bravely against the home-thrusting enemy.

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